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CONTENTS

January / March 2010

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Brazilian Journal of Videoendoscopic Surgery

Editorial

Interpretation and Development of Scientific Articles - Search for Scientific Articles

Interpretação e Desenvolvimento de Artigos Científicos - Busca de Artigos Científicos

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Aiming to review important concepts about the interpretation and preparation of scientific articles, we decided to write a series of six articles on the subject covering: the search for scientific articles, case reports and case series, case-control and cohort studies, clinical trials, basic biostatistics concepts, and systematic reviews and metanalyses. This is the first article in the series and introduces issues about how to conduct an electronic search for scientific articles.

In order to keep up to date, a physician must access the scientific literature. This can be is done by consulting renowned colleagues or professionals, but we should keep in mind that – even with the best of intentions – this information may be incorrect or outdated.[1] Therefore, the best way to obtain access to quality scientific information is through well-conducted scientific studies.[2]

Information extracted from scientific journals deserves more credibility. There are, however, hundreds of journals in the biomedical literature, and nearly two million articles are published each year. It is impossible to capture all this information. With the demands of modern life, time is precious and cannot be lost in vain; therefore, it is essential that the physician or surgeon knows how to select and interpret reports that are methodologically rigorous, not wasting time with publications of inferior quality. One measure of quality is the journal's impact factor, the higher the factor, the better the article, although this is not an infallible rule. An example of this fallibility is the case of a South Korean scientist who published an article on assisted reproduction in a magazine of high-impact; it was later shown that the data was fabricated. In relation to electronic databases, those which have a clear scientific connotation – as will be seen with several examples below – those published by respected medical societies should be valued, and we should always question those that are generated by companies with commercial interests or by lay writers.

The first relevant issue relates to the purpose of reading the material that is be sought with a search. The most common day-to-day practice is the reading out of curiosity. The reader leafs through several medical journals until he finds an article of interest. After reading the article quickly (and sometimes only the abstract), the reader moves to another topic or simply stops reading. Knowledge obtained in this way is usually too little and too disperses to lead us to alter out medical practice. Despite the shortcomings of this approach, it is certainly better than be kept up to date exclusively by the reports provided by the pharmaceutical industry.

The acquisition of knowledge will be much more fruitful if the physician knew exactly what he was looking for,[3] directing all efforts to respond to an initial question, such as: Does the use of local anesthesia in the ports of a laparoscopic surgery reduce postoperative pain? Thus, the first step for interpreting the medical literature is to formulate a question and proceed in search of an answer. For this task to be carried out in a way that delivers the best results there is a sequence to be followed. The first step is to correctly formulate a question of interest. Avoid themes that are too broad and lack a defined focus.

The question should be specific with a well-defined focus of interest. With the subject clearly defined, begin the process of selecting the best studies.

There are various sites from which to search for scientific articles. We offer an example using PubMed (www.pubmed.com) which is site most frequently used by health professionals. PubMed has more than 19 million articles in its database.[4] More than 800 million searches are conducted each year on more than 5,300 scientific journals. More than 12,500 articles are added each week.[5]

In order to obtain the articles in a faster and more thorough way, there are some basic steps that should be followed. The first is to use MeSH (Medical Subjects Headings) terms. This tool is important to direct our search so that it encompasses the scope we want with a specific term, and is based on its meanings and on previously indexed terms. For example, with the word "endometrial" we have 41 options (put "Mesh" in search option and click on "search" without putting any term - Figure 1. On the other screen, just type "endometrium" - Figure 2) – which would make our search yield an excessive number of articles if what we wanted to search for was only "endometrial hyperplasia." Conducting this search (certainly this number increases with time) using only the term "endometrial," 37,033 articles were found (Figure 3); 4,610 are found when we associate "endometrial" with "hyperplasia" and 2,629 using the MeSH term (just put *"endometrial hyperplasia" [Mesh]* in Pubmed database - Figure 4). We can also limit more by using *"Endometrial Hyperplasia" [MeSH Major Topic]* and retrieve the most relevant manuscripts - here we found 1603 articles (Figure 5).

The difference of approximately 2000 articles between a search using a paired terms and using a MeSH term is due to the fact that with the first, the endometrial hyperplasia need only be cited, but may not be the principal focus. On the other hand, when you use the MeSH term, hyperplasia is always one of the principal foci of the article, which greatly facilitates our search. We should always have in mind two concepts when performing a search: sensitivity (we are able to obtain all the articles we want) and specificity (we avoid those that we don't want in order to not loose time reading articles that are not relevant). Besides the use of MeSH terms, there are various strategies to achieve this. The first of these is the use of Boolean operators: AND, OR, NOT. AND is used to link words. Using the same example, in using AND between "endometrial"` and "hyperplasia," you would only have access to articles that use these two words in their titles and/or abstracts or key words (4596 articles). By using OR between the two terms one will obtain the articles that use one or the other, obviously then we have a larger number (116,627). In using NOT one must pay attention to the fact that the articles that *have* the word after the NOT will be excluded. Thus

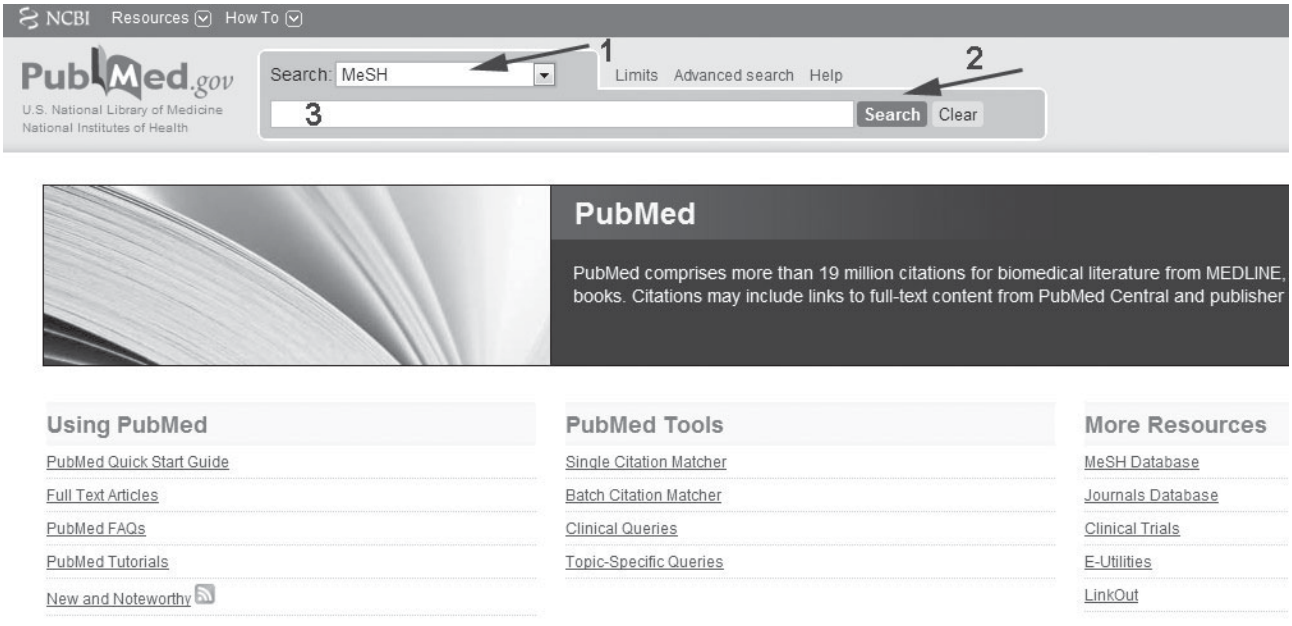

Figure 1 *– Pubmed screenshot .1- MeSH selected in search box; 2- Search button; 3- click the search button without any term.*

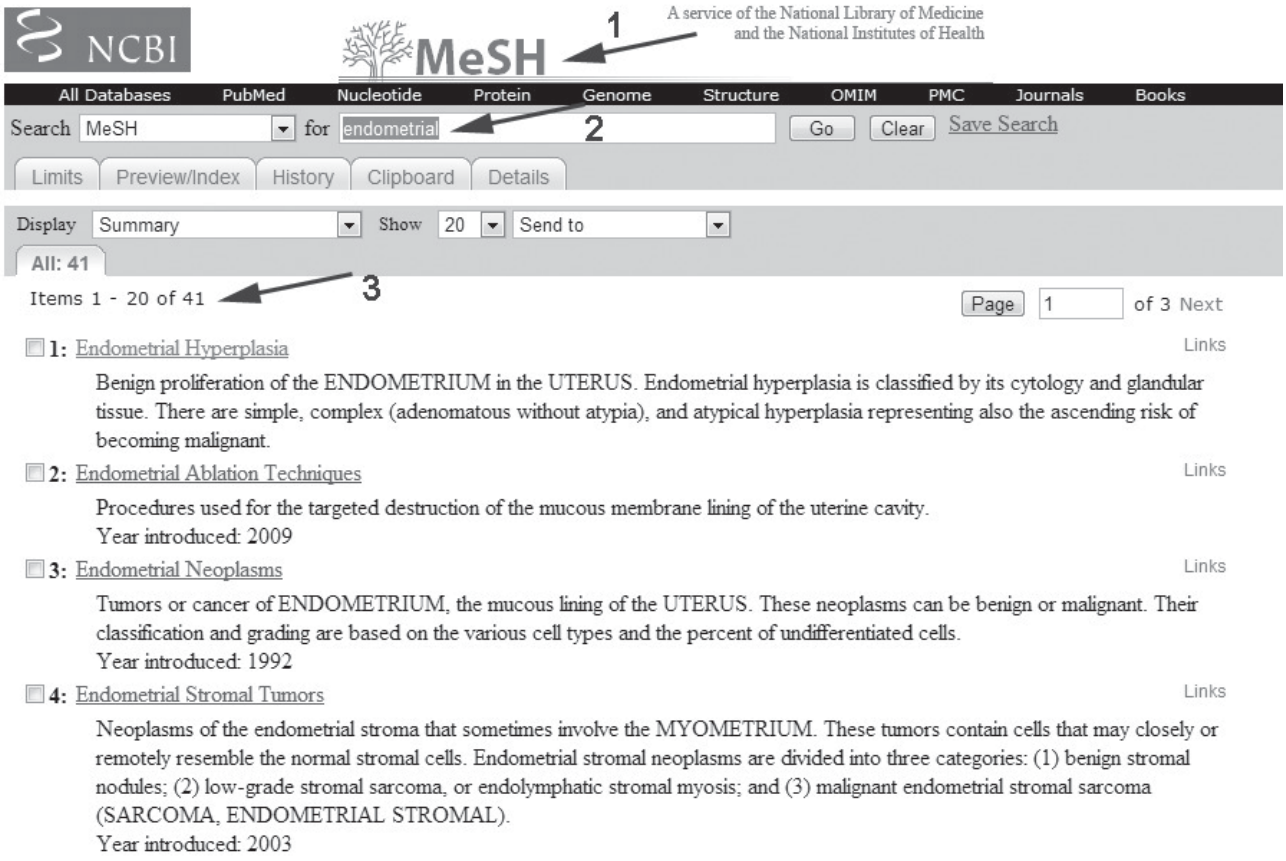

Figure 2 *– Mesh screenshot .1- MeSH in the title; 2- look for "endometrial" term; 3- 41 articles were retrieved.*

if one searches "endometrial" NOT "hyperplasia" 32,275 articles will be obtained (slightly fewer than the initial 37,033). This function serves, for example, when one wants to obtain some information, but which does not affect a group or specific disease. For example, the use of antidepressants to treat urinary incontinence in patients without depression.

There are situations in which a search should be done with various terms in order to not run the risk of missing any articles. For example, the words "cancer" and "neoplasm" can mean the same thing, but the articles may have been indexed with only one of them. Another very common situation occurs when you want to find articles with a term whose terminus (or beginning) can be written various ways such as, for example, in myomectomy via laparoscopy. The word can be written as the noun "laparoscopy" or adjective "laparoscopic". In such cases one can use a character "*" which denotes truncation after the last letter that the two terms have in common, in this example: "laparoscop*". There are situations is when the same word is spelled two or more ways. We can spell the abdominal surgical approach to the interruption of gestation as "cesarean" or "caesarean" delivery. In these situations, the search should be performed using both spellings.

One way to refine the search is to search for the term only in the title of the article making use of [ti] immediately following the word. An option to search the title, MeSH terms, and abstract (all together) is by using [tw] immediately following the term. If you want only articles of a certain author, all one has to do is use [au] after the author's name using the format: surname and initials (without periods) - ex: Smith JA[au]. Searches can also be done according to date of publication by using [dp]; ex. 2001[dp].

A very useful tool is the use of "limits" (Figure 3) which permits one to focus the search according to type of study (clinical trial, metanalysis, case report, etc.), gender (male, female), humans or animals, language (English, Spanish, French, Portuguese, etc.), age of the groups studied, and by a range of dates which define a period of publication. The use of all these

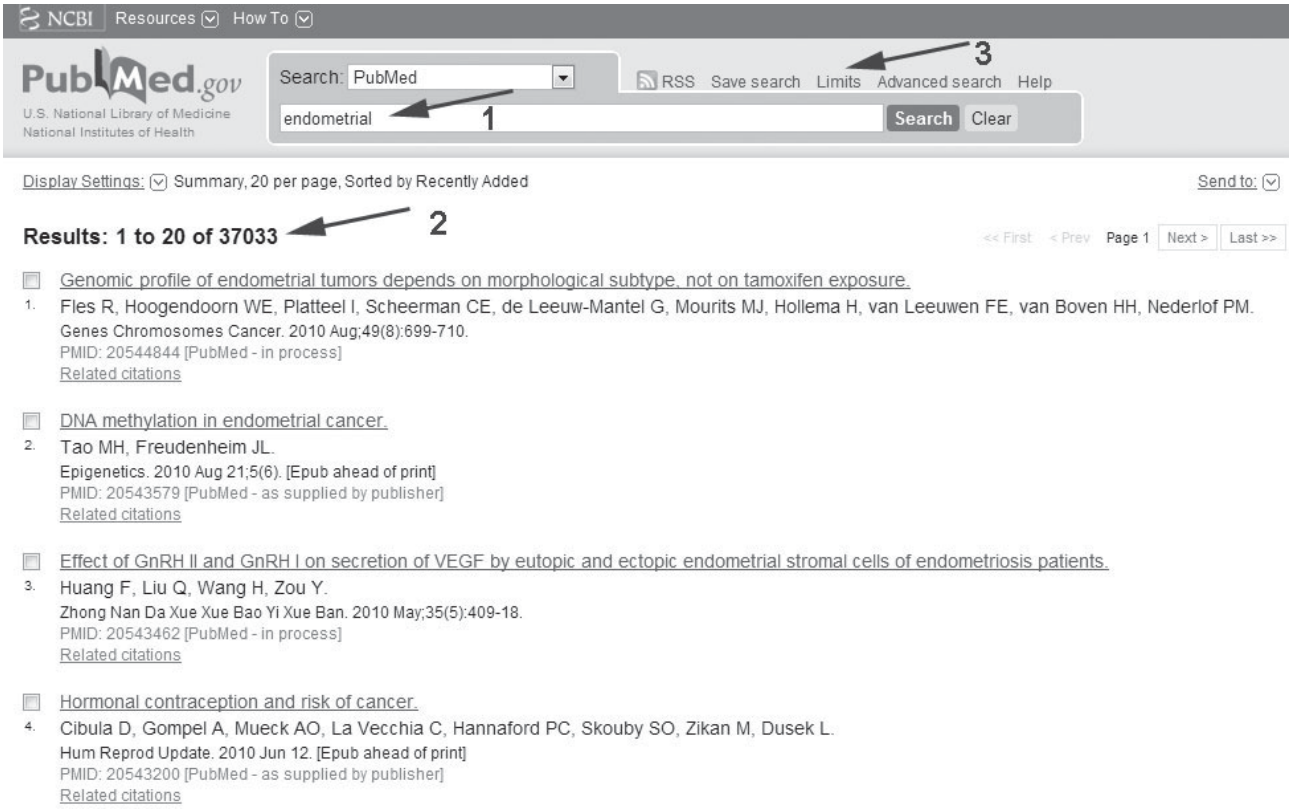

Figure 3 *– Pubmed screenshot .1- look for "endometrial" term in Pubmed (not in MeSH as before); 2- 37,033 articles were retrieved; 3- "Limits"option.*

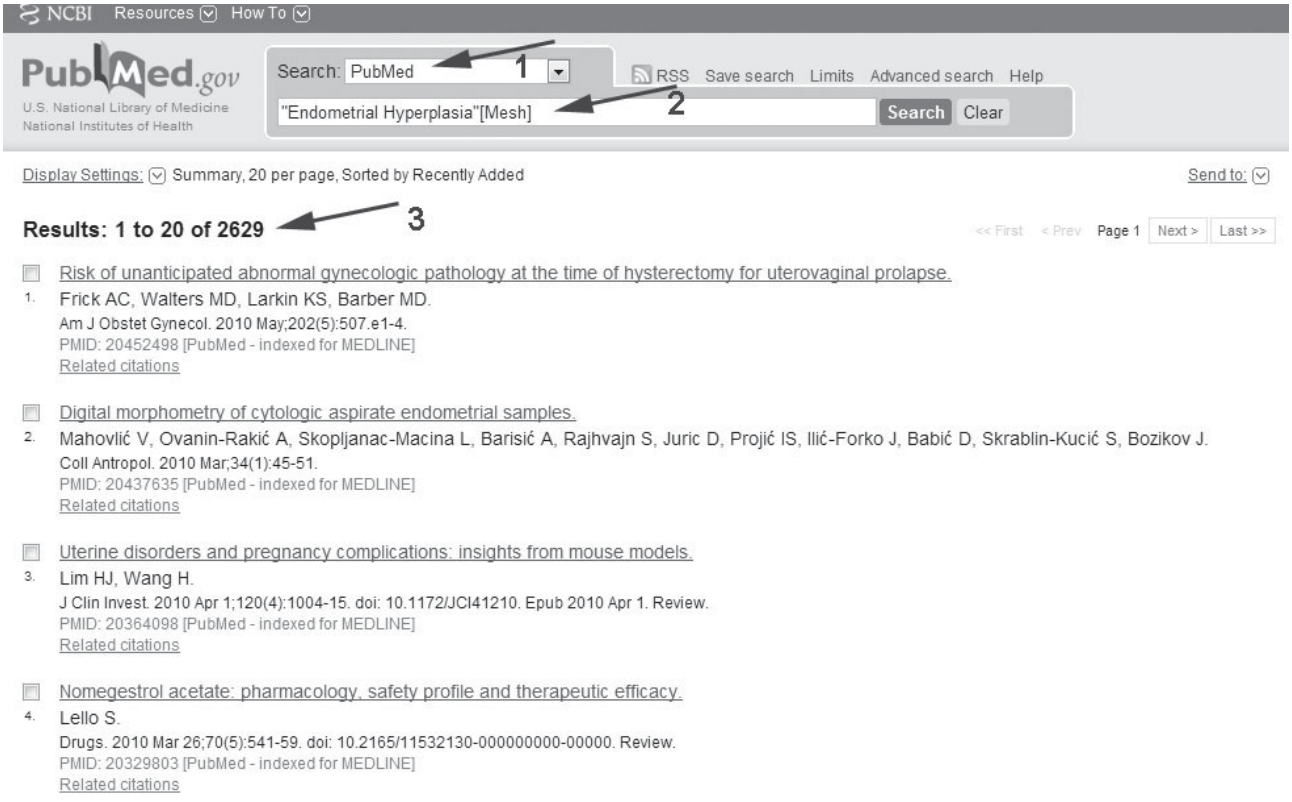

Figure 4 *– Pubmed screenshot .1- Pubmed selected in search box ; 2- look for "endometrial hyperplasia [MeSH]" term in Pubmed; 3- 2,629 articles were retrieved.*

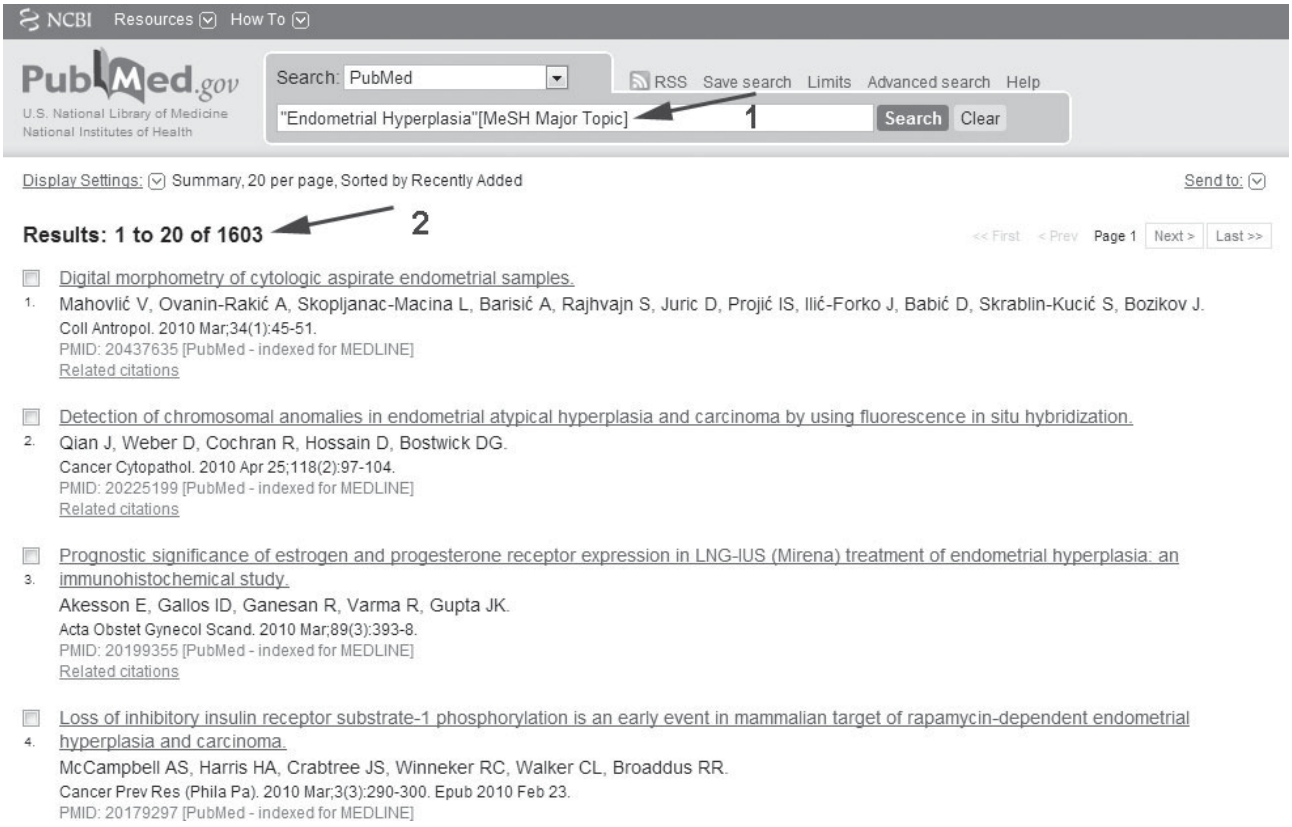

Figure 5 *– Pubmed screenshot .1- look for "endometrial hyperplasia [MeSH Major Topic]" term in Pubmed; 2- 1,603 articles were retrieved.*

tools can save considerable time. Several menu options (after clicking on "advanced search" – beside "limits"):

- Preview /Index: useful to preview how many references were found before actually displaying the articles. You may elect to can increase or decrease the breadth of the search according to the number encountered.

- History: useful to combine previous searches, i.e. building one search on prior searches. The limit is 100; after this number, the newest search substitutes the oldest. There is a button to clear the history (to erase the previous searches).

After the appearance of the articles, one of the ways of recording the abstracts is the following (Figures 6 and 7):

1. check the boxes of the articles/abstracts of interest;
2. beside "Display settings" (in the upper left corner next) one can select the abstracts (it shows de summary) and in "sort" one can choose the order according to author, by date of publication, or by journal;
3. One may click on the "send to" button (in the upper right corner) and choose the save format (copy to clipboard or save in "txt" format that can be saved in Microsoft Word by copying and pasting).

For each article (usually after the summary) there is a "linkOut" button (links to a site with a complete version of the article, usually in HTML or pdf formats). In the majority of cases, the link is to a site maintained by the journal's publisher, where access to the full article is permitted only by those who have a subscription, or when the search is conducted from universities and research facilities which have an institutional superscription. If one cannot access the complete article, it can be ordered from a subscribing library. Charges vary depending on whether the journal is available in libraries in the same city, in Brazil, or abroad. Currently, this charge is R$ 0.10 per page for journals available in libraries in Rio de Janeiro, R$ 5.00 for those available in Brazil, and close to R$ 30 for those only available abroad. Sending e-mails to the author is an efficient way to obtain the complete article. We have done this successfully several times.

Other sites that provide scientific texts are the sites of BIREME (http://regional.bvsalud.org/php/

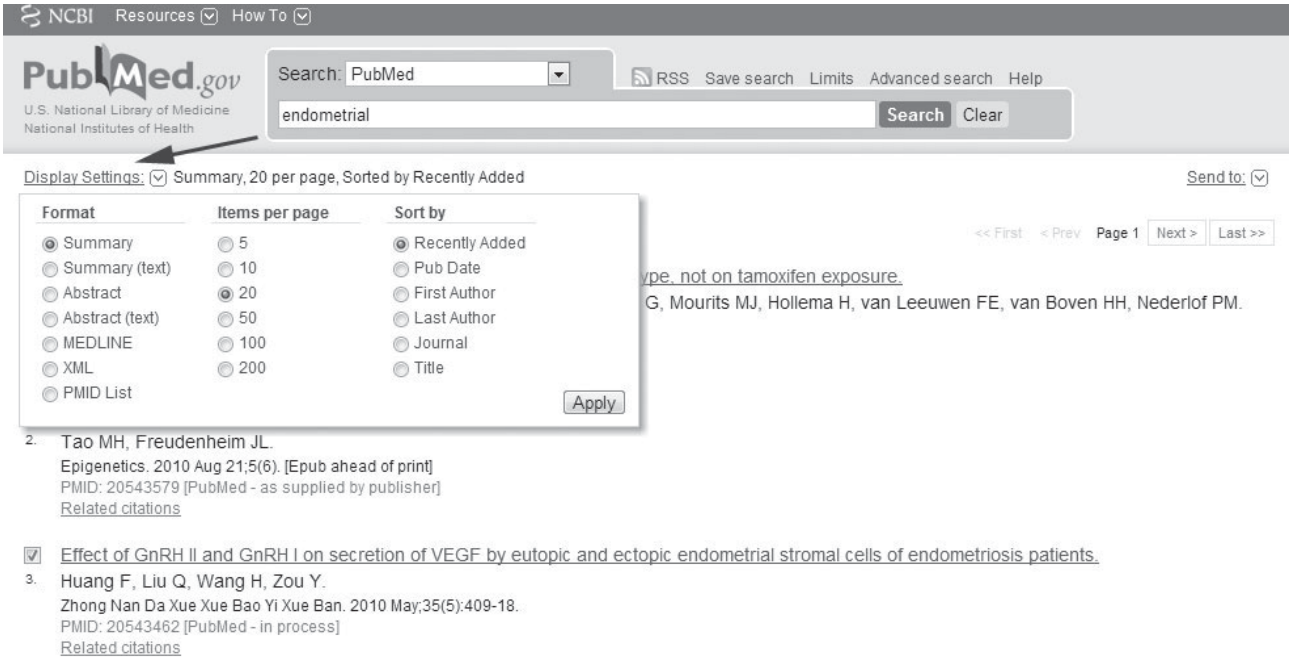

Figure 6 *– Pubmed screenshot . Arrow – "Display settings" options.*

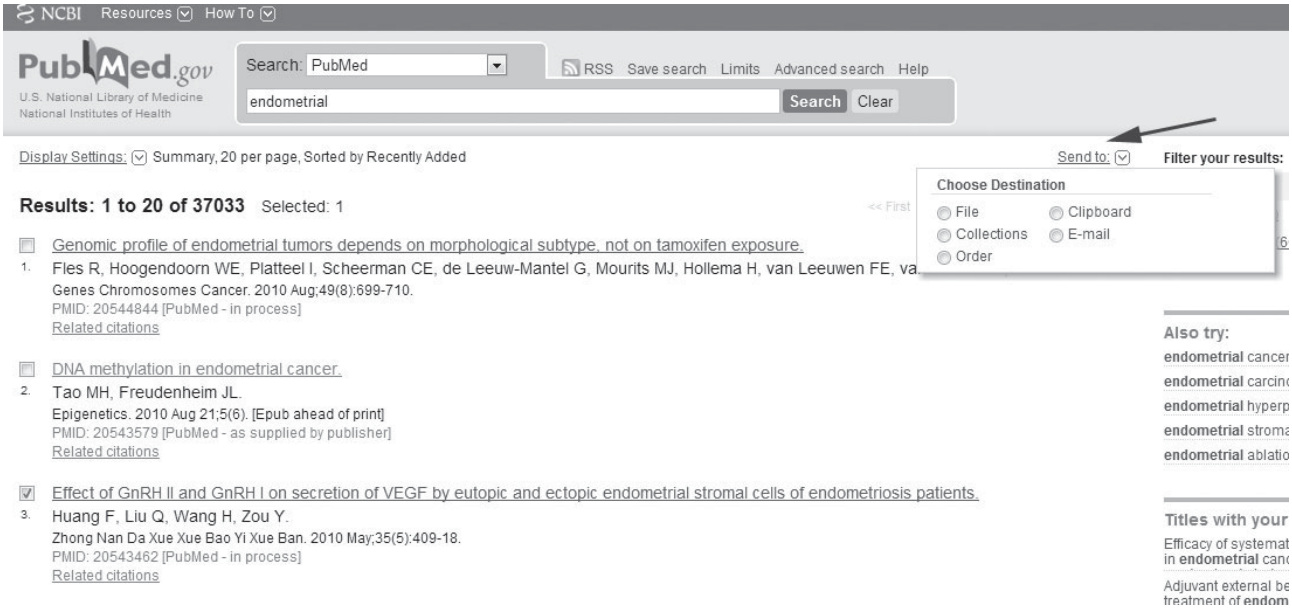

Figure 7 *– Pubmed screenshot . Arrow – "Send to" options.*

index.php) where there are links for SCIELO (www.scielo.org) and the Cochrane Collaboration (www.cochrane.org). Cochrane provides the full meta-analyses of clinical trials, and is considered the leading source of systematic reviews in terms of the quality of scientific evidence. More than 400,000 clinical trials are part of its collection of studies analyzed in the metanalyses carried out by collaborators organized according to thematic areas. Scielo provided full texts of periodicals from Latin America and Spain and Portugal. Scielo's search commands for finding abstracts in these databases are similar to those of PubMed, but not necessarily equivalent, details of which are beyond the scope of this article.

EMBASE (www.embase.com) offers studies in the areas of biomedicine and pharmacology with emphasis in clinical drug trials.

UpToDate Online (www.uptodate.com) is a database of evidence-based reviews prepared by more than 3800 experts on various subjects. Reviews are updated frequently and the online version permits rapid searches for answers on the most diverse topics. Its function is to synthesize the information from studies for clinicians and scholars who do not have time to read the body of literature about a given topic.

PERIODICOS-CAPES (www.periodicos.capes.gov.br) is available in various Brazilians educational institutions and is a very useful tool. This *site* permits access to innumerable high quality articles. It offers access to the complete texts of more than 11,000 domestic and international publications of the most varied topics (not just health, but engineering, astronomy, etc.). After accessing one of the journals, there is a search field on the top of the screen that can be used to find the term of interest in all of the available journals (included in this specific database) of the same publisher (p.ex. Elsevier). It is usually available without cost at university libraries.

The dominance force in the market for internet search, Google provides a resource for scientific articles, Google Scholar (www.scholar.google.com). It has the advantage of being accessible to anyone, although the articles shown in the results are not necessarily available as complete texts. It has the disadvantage of finding enormous quantities of information, not all of them totally reliable.

After the initial selection of articles, the professional should have the ability to select the best that deserve a more detailed reading. One should begin with the section on materials (or patients) and methods. Here the reader should evaluate the quality of the study and verify if the article is worth reading in full. There's no point in familiarizing oneself with the results and conclusions of the study if the scientific method is grossly flawed; in other words, if you're going to decide to disregard an article you might as well do so before reading the results.

There are four fundamental attributes of a good scientific study, namely: 1 - adequate design of the study; 2 - quality in obtaining the data; 3 - correct statistical analysis of the data; and 4 - conclusions which are derived from the analysis of the data. Any flaw in the first two items (systematic errors) is fatal for a good study. One can always re-analyzing data and come to different conclusions, but one cannot reassemble a study that was poorly designed from the outset or in which the data was precariously collected. The first step that one should undertake is to analyze the type of study that was carried out. Studies can be divided into four large groups, in increasing order of better scientific evidence: 1 - case reports and case series; 2 - observational studies (prospective longitudinal "cohort"; retrospective longitudinal "case-control"; transverse (ex.: census surveys, questionnaires); 3 - experimental studies (randomized controlled clinical trials); 4 - systematic reviews and meta-analyses (which seek to collect the studies with the highest quality methodology and generate a synthesis of the best available evidence). In the next article in this series, case reports and case reports will be analyzed.

As we can note in this text, the dissemination of scientific knowledge depends not only on the availability of good journals and articles, but also a lot of practice to obtain it.

ADDITIONAL READING

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Brazilian Journal of Videoendoscopic Surgery

Editorial

Interpretação e Desenvolvimento de Artigos Científicos - Busca de Artigos Científicos

Interpretation and Development of Scientific Articles - Search for Scientific Articles

MARCO AURELIO PINHO DE OLIVEIRA[1]; RAPHAEL CAMARA MEDEIROS PARENTE[2]

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Com o intuito de revisar conceitos importantes sobre a interpretação e elaboração de artigos científicos resolvemos escrever uma série de seis manuscritos sobre o assunto, envolvendo: busca de artigos científicos, relato de casos e série de casos, estudos caso-controle e de coorte, ensaios clínicos, noções de bioestatística básica e revisões sistemáticas e metanálises Este é o primeiro da série e introduz considerações sobre como fazer a busca eletrônica de artigos científicos.

Para que o médico se mantenha atualizado é necessário o acesso à literatura científica. Isto pode ser feito consultando-se colegas ou profissionais de notório saber, mas devemos ter em mente que nesta hipótese, mesmo com as melhores das intenções, esta informação pode ser errada ou desatualizada[1]. Portanto, a forma mais válida de obtermos acesso à informação científica de qualidade é por meio de trabalhos científicos bem conduzidos[2]. Informações extraídas de revistas científicas são as que merecem maior credibilidade. Porém, existem milhares de periódicos na literatura biomédica e cerca de dois milhões de artigos são publicados a cada ano. É virtualmente impossível tentar captar todas estas informações. Com os afazeres da vida moderna, o tempo é precioso e não se pode perdê-lo inutilmente, sendo imprescindível que o médico saiba selecionar e interpretar os trabalhos que apresentem uma melhor qualidade metodológica, não perdendo tempo com publicações de qualidade inferior. Uma das formas de se aferir esta qualidade é por meio do fator de impacto da revista que, quanto maior, melhor o manuscrito, embora isto não seja uma regra infalível. Exemplo disto é o caso recente de um cientista sul-coreano que publicou artigo sobre reprodução assistida em uma revista de alto impacto e que posteriormente foi demonstrado que os dados eram falsos. Em relação aos bancos de dados eletrônicos, devem-se valorizar mais os que têm uma clara conotação científica como daremos alguns exemplos abaixo, aqueles de sociedades reconhecidas na área e sempre devemos desconfiar daqueles que são geridos por empresas com fins comerciais e por leigos.

O primeiro aspecto relevante refere-se ao objetivo da leitura. A prática que mais se observa no dia-a-dia é a leitura por curiosidade. Nesta, o leitor folheia algumas revistas médicas até encontrar algum artigo de interesse. Após ler rapidamente o trabalho (e às vezes, apenas o resumo), o leitor passa para outro tema ou simplesmente interrompe a leitura. O conhecimento obtido desta forma normalmente é insuficiente para que possamos mudar a prática médica. Apesar das críticas, ainda é melhor que a atualização feita exclusivamente pelos informes das indústrias de laboratório.

A obtenção de conhecimento será muito mais proveitosa se o médico souber exatamente o que está procurando[3], orientando todos os esforços para responder a uma pergunta inicial, como por exemplo: O uso de anestésico local nos portais de uma cirurgia laparoscópica reduz a dor no pós-operatório? Portanto, o primeiro passo para interpretar a literatura é formular um problema e sair em busca de uma resposta. Para esta tarefa ser feita da forma que traga melho-

res resultados há uma sequência a ser seguida. A primeira é a forma correta de fazer a pergunta de interesse. Evitar temas amplos e sem um foco definido. A pergunta deve ser específica e com um foco de interesse bem determinado. Já com o assunto claramente definido, inicia-se o processo de seleção dos melhores trabalhos.

Para tal, há vários sites de buscas de artigos científicos. Daremos um exemplo usando o PubMed (**www.pubmed.com**) que é o o mais utilizado pelos profissionais da área da saúde. Ele possui mais de 19 milhões de artigos em sua base de dados[4]. Mais de 800 milhões de buscas são feitas a cada ano em mais de 5300 revistas científicas. Mais de 12.500 artigos são acrescentados a cada semana[5].

Para se obter os artigos da forma mais completa e rápida, alguns passos básicos devem ser aprendidos. O primeiro é fazer uso do MeSH (Medical Subjects Headings). Esta ferramenta é importante por direcionar nossa busca para o escopo que queremos de determinado termo, baseando-se em seus significados e em termos previamente indexados. Por exemplo, com a palavra ´endometrial“ nós temos 41 opções (colocar Mesh na opção search e clicar no botão “search” sem colocar nenhum termo – Figura 1; na outra tela, basta digitar “endometrial” – Figura 2) - o que deixaria nossa busca com um número excessivo de artigos caso o interesse fosse pesquisar somente ´´endometrial hyperplasia“. Ao fazermos a busca (certamente o número aumenta com o passar do tempo) foram encontrados 37.033 artigos ao usarmos somente o termo ´´endometrial‘ (Figura 3)‘; 4610 ao associarmos´´endometrial“ com ´´hyperplasia“ e 2629 ao usarmos o termo no MeSH (para isto basta colocar “endometrial hyperplasia”[Mesh] no **Pubmed** – Figura 4). Podemos limitar ainda um pouco mais colocando os manuscritos mais relevantes: “Endometrial Hyperplasia”[MeSH Major Topic] – neste caso são encontrados 1603 artigos (Figura 5).

A diferença de aproximadamente dois mil artigos entre a busca com o termo associado e com o MeSH deve-se ao fato de que, no primeiro, a hiperplasia de endométrio é citada mas pode não ser o foco principal, por outro lado, quando se usa o MeSH, a hiperplasia era sempre um dos focos principais do artigo, o que facilita nossa busca. Sempre devemos terem mente dois conceitos ao efetuarmos uma busca: sensibilidade (conseguirmos obter todos os artigos que queremos) e especificidade (não obtermos os que não queremos para não perdermos tempo em ler o que não serve). Para isto existem várias estratégias além do uso do MeSH. A primeira delas é o uso dos marcadores booleanos: AND, OR, NOT. O AND serve para unir palavras. Usando o mesmo exemplo ao se fazer uso do AND entre ´´endometrial“ e ´´hyperplasia“, só se terá acesso aos artigos que usam estas duas palavras nos seus títulos e/ou resumos ou palavras-chaves (4596 artigos). Ao se fazer uso do

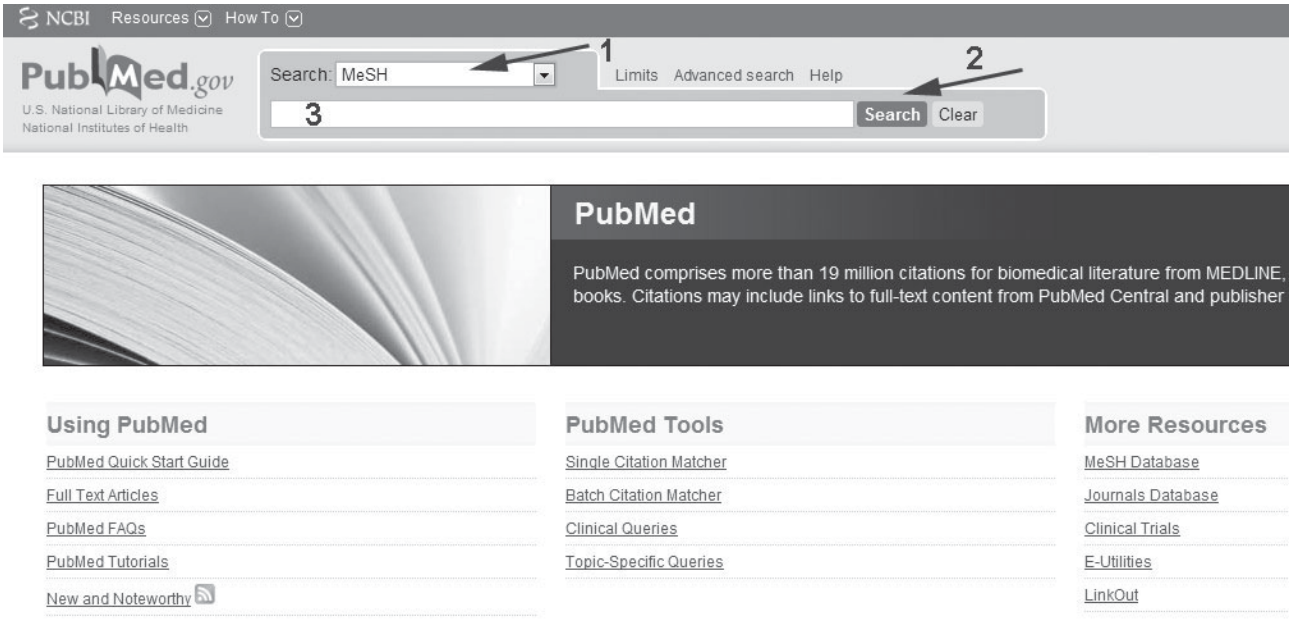

Figura 1 *– Página da Pubmed. 1 - MeSH selecionado na caixa de pesquisa, 2 - botão de pesquisa, 3 - clique no botão de pesquisa sem inserir nenhuma palavra.*

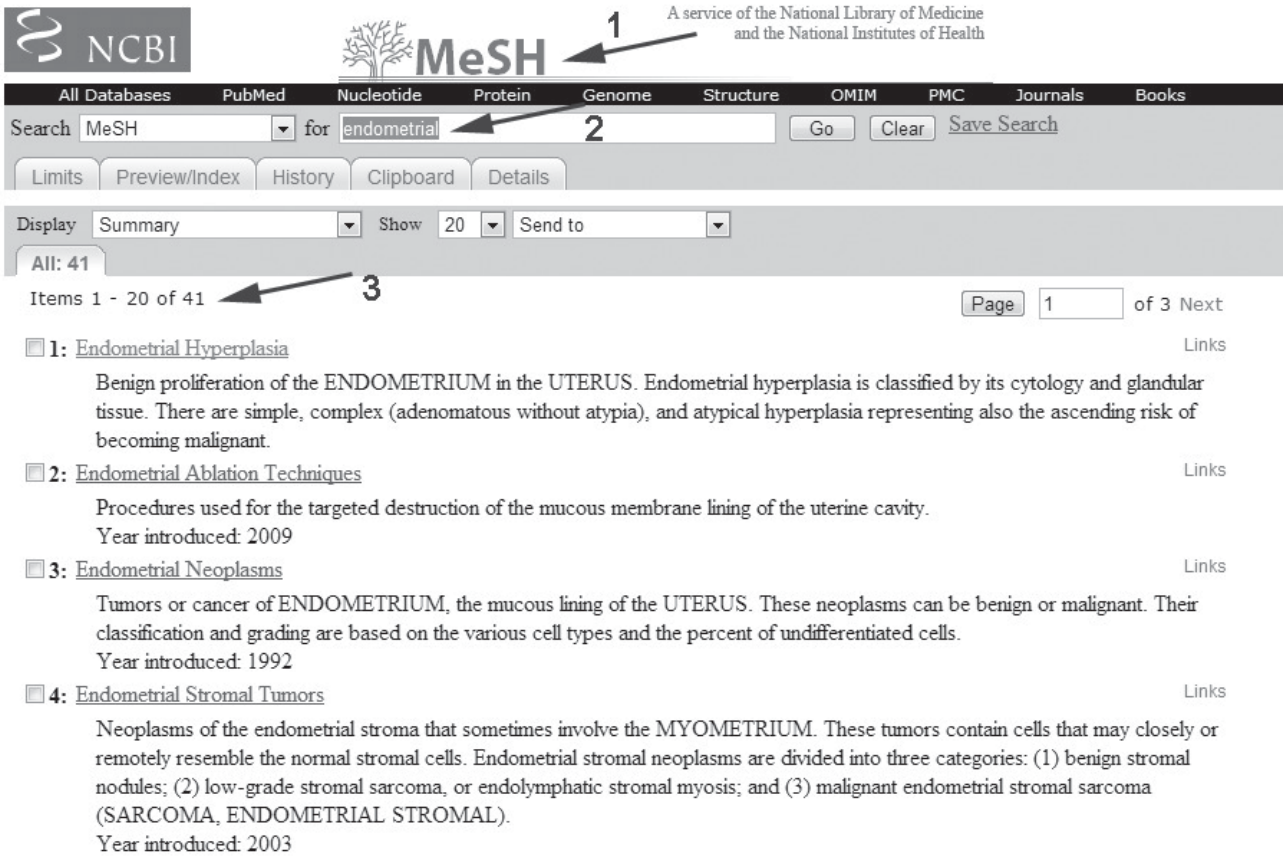

Figure 2 *– Página do Mesh.1- MeSH no título; 2- procurar pela palavra "endometrial" ; 3- 41 artigos foram selecionados.*

OR entre as duas serão obtidos os artigos que usam uma ou a outra, então obviamente teremos um número maior (116.627). Ao se fazer uso do NOT deve-se atentar para o fato que os artigos que têm a palavra após o NOT não serão obtidos. Então ao se colocar ´´endometrial" NOT ´´hyperplasia" serão obtidos 32275 artigos (pouco menos que os 37.033 iniciais). Esta função serve, por exemplo, quando se quer obter uma informação mas que não atinja um grupo ou doença específica. Como, por exemplo, o uso de antidepressivos em pacientes sem depressão (para incontinência urinária, por exemplo).

Há situações em que a busca deve ser feita com vários termos para não se correr o risco de perder nenhum artigo. Por exemplo, as palavras ´´cancer" e ´´neoplasm" podem significar a mesma coisa, porém os artigos podem ter sido indexados por somente uma delas. Outra situação bastante comum é quando se quer obter artigos de um termo que pode ser escrito na sua parte final (ou inicial) de diversas formas como, por exemplo, na miomectomia por laparoscopia. A mesma pode ter sido escrita como ´´laparoscopy" ou ´´laparoscopic". Então se usa o marcador de truncamento "* "após a última letra em comum entre os termos, ou seja: "laparoscop*". Há situações em que a mesma palavra é escrita de duas ou mais formas. Podemos escrever a interrupção da gestação por via abdominal como ´´cesarean" ou ´´caesarean". Nestas situações, a busca deve ser efetuada das duas formas.

Uma forma de sensibilizar a busca é procurar pelo termo somente no título do artigo fazendo uso de [ti] logo após a palavra. Uma opção para buscar no título, MeSH e resumo (ao mesmo tempo) é fazer uso de [tw] logo após o termo. Caso se deseje somente artigos de um determinado autor, é só fazer uso de [au] após o nome do autor: sobrenome e iniciais (sem pontuação) - ex: Smith JA[au]. Também a busca pode ser por data de publicação ao se fazer uso de [dp] – data de publicação; p.ex. 2001[dp].

Uma ferramenta muito útil é o uso do ´´limits" (Figura 3), que permite focar a busca por tipo de estudo (clinical Trial, metanalysis, case report, etc..), gênero (male, female), humano ou animais, línguas

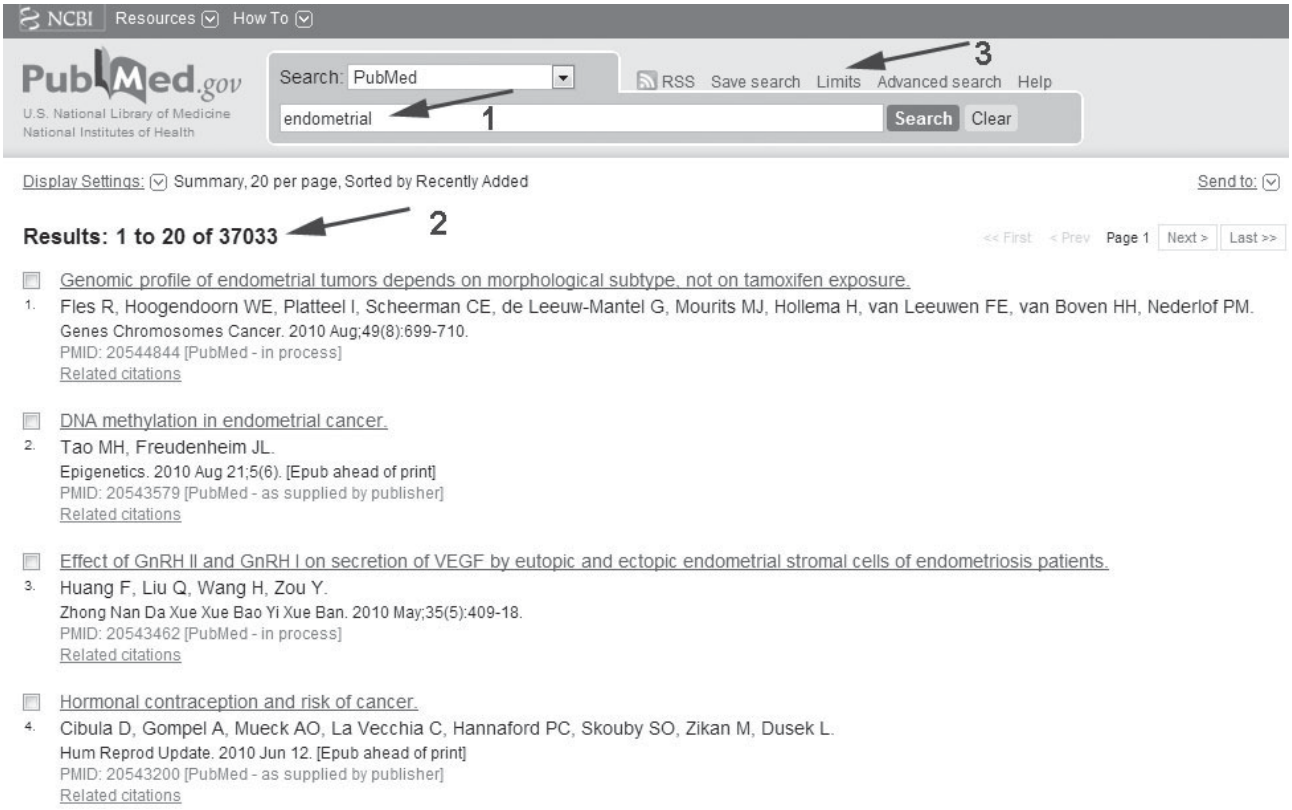

Figure 3 *– Página da Pubmed.1- procurer pela palavra "endometrial" no Pubmed (não no MeSH como antes); 2- 37,033 artigos foram selecionados; 3- opção "Limits".*

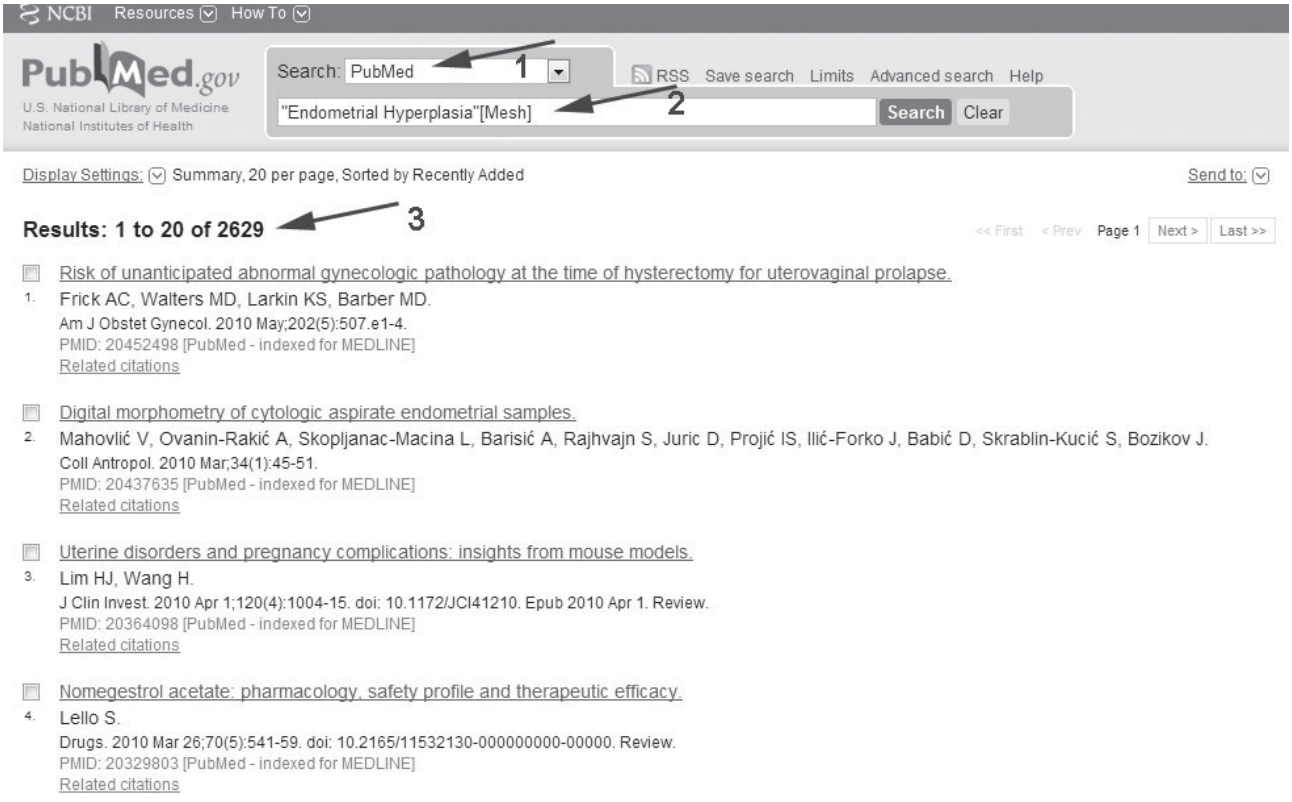

Figure 4 *– Página do Pubmed .1- Pubmed selecionado na caixa de pesquisa ; 2- procurar por "endometrial hyperplasia [MeSH]" no Pubmed; 3- 2,629 artigos foram selecionados.*

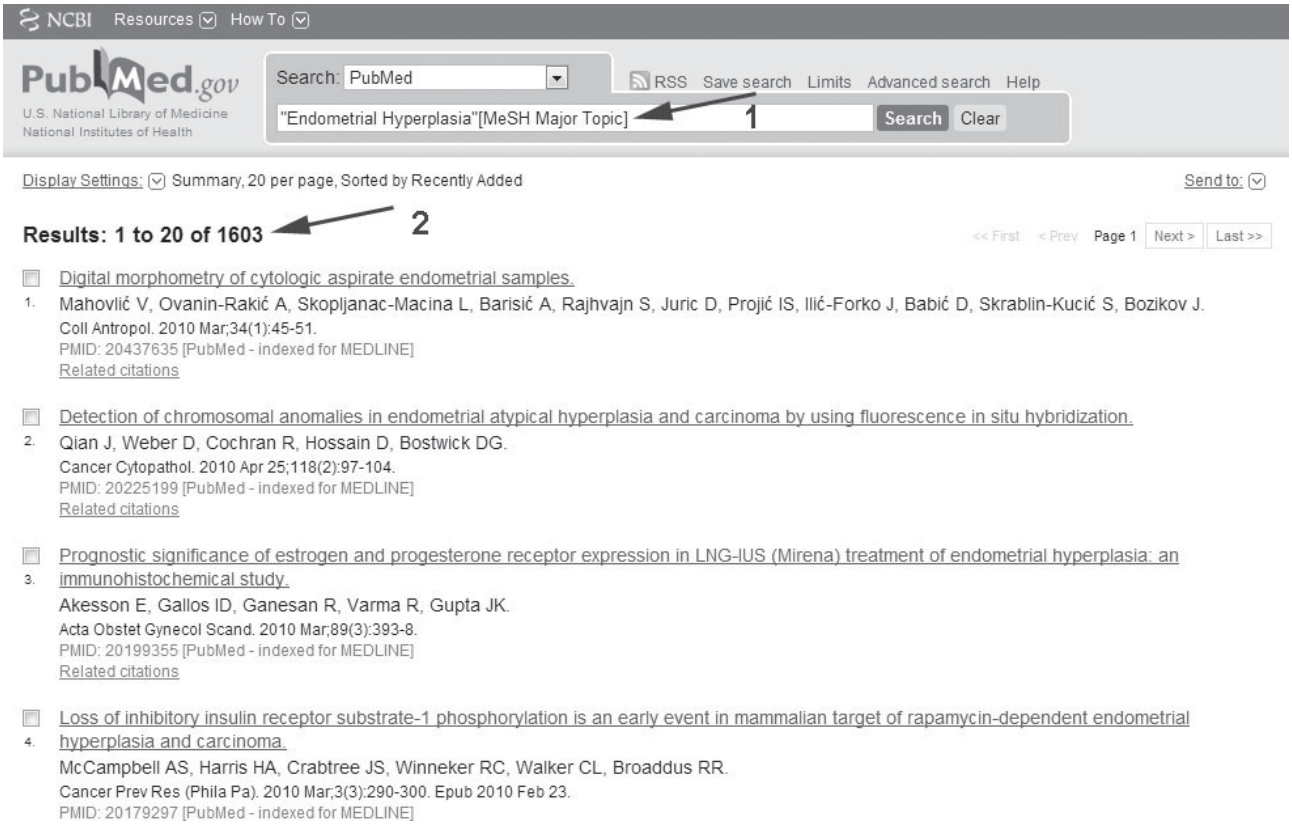

Figure 5 *– Página do Pubmed.1- procurer por "endometrial hyperplasia [MeSH Major Topic]" no Pubmed; 2- 1,603 artigos foram selecionados.*

(inglês, espanhol, francês, português, etc..), idade dos grupos estudados e por período de publicação. Tudo isto somado pode trazer um ganho considerável de tempo.

Algumas outras opções – após clicar no "advanced search"(ao lado do "limits"):

- Preview /Index: útil para ver (antes de mostrar os artigos) quantas referências são encontradas. Você pode aumentar ou diminuir o espectro de acordo com o número obtido.

- History: útil para combinar as buscas previamente realizadas. O número máximo é 100. Após este número, a nova busca substitui a mais antiga. Existe o botão clear history (para apagar as buscas antigas).

Após o aparecimento dos artigos, uma das maneiras de gravar os resumos é a seguinte (Figura 6 e 7):

1. selecione os quadrados que interessam;

2. ao lado do "Display settings" (canto superior à esquerda) pode ser selecionado o abstract (vem o resumo) e em sort pode-se escolher a ordem por autor, data ou jornal);

3. pode-se apertar o botão "send to" (canto superior à direita) – e escolher como quer salvar (copiar para o "clipboard ou gravar arquivo "txt"que pode ser copiado e colado para o "Word" posteriormente).

Existe em cada artigo o botão "linkOut" (pode ter link para um site com o artigo na íntegra), que fica normalmente logo após o término do resumo (clicando no nome do artigo após a busca) Na maioria das vezes, o acesso ao artigo só é permitido para quem tem assinatura ou quando a busca é feita em instituições que permitem o acesso tais como universidades, instituições de pesquisa, etc.. Caso não se consiga acesso aos artigos completos, ele deve ser solicitado por meio de uma biblioteca credenciada. O pagamento é diferenciado para os disponíveis em bibliotecas na mesma cidade, no Brasil e no exterior. No ano atual, este pagamento é de R$ 0.10 por página para os disponíveis em bibliotecas do Rio de janeiro, de R$ 5 para os disponíveis no Brasil e de cerca de R$ 30 para os disponíveis só no exterior. Mandar emails para os autores é uma forma bem eficaz de se obter o artigo completo. Já fizemos isto algumas vezes com êxito.

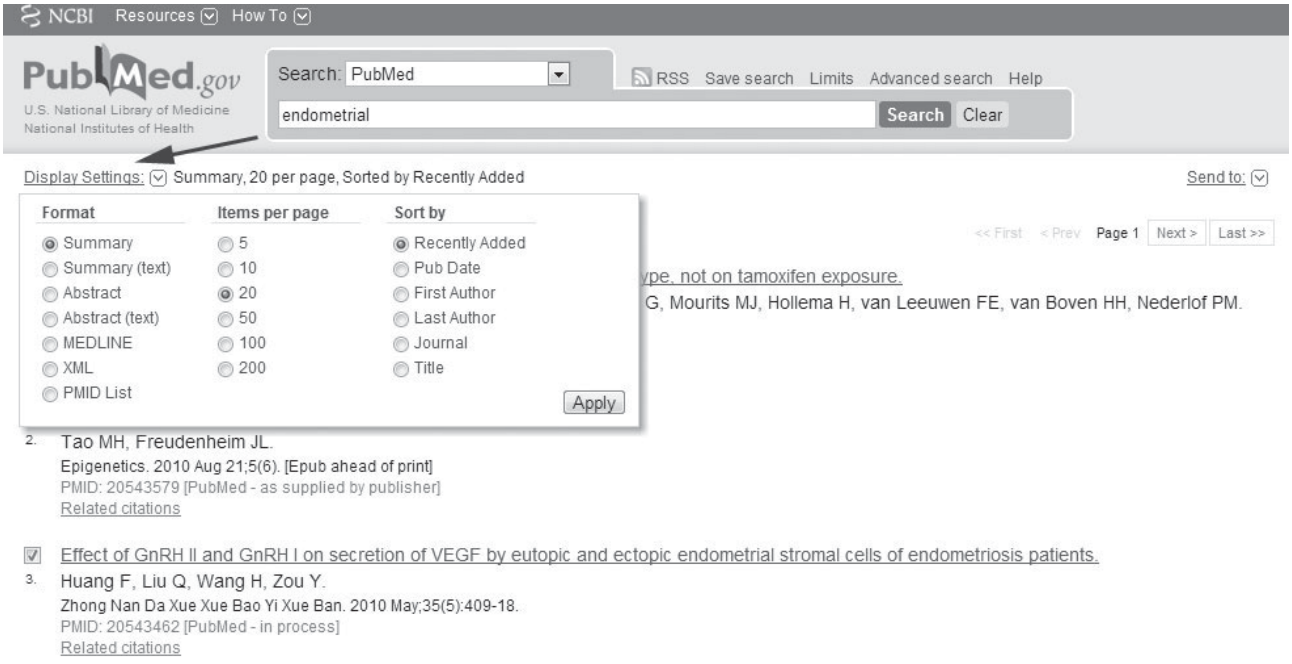

Figure 6 *– Página do Pubmed. Seta – opções "Display settings".*

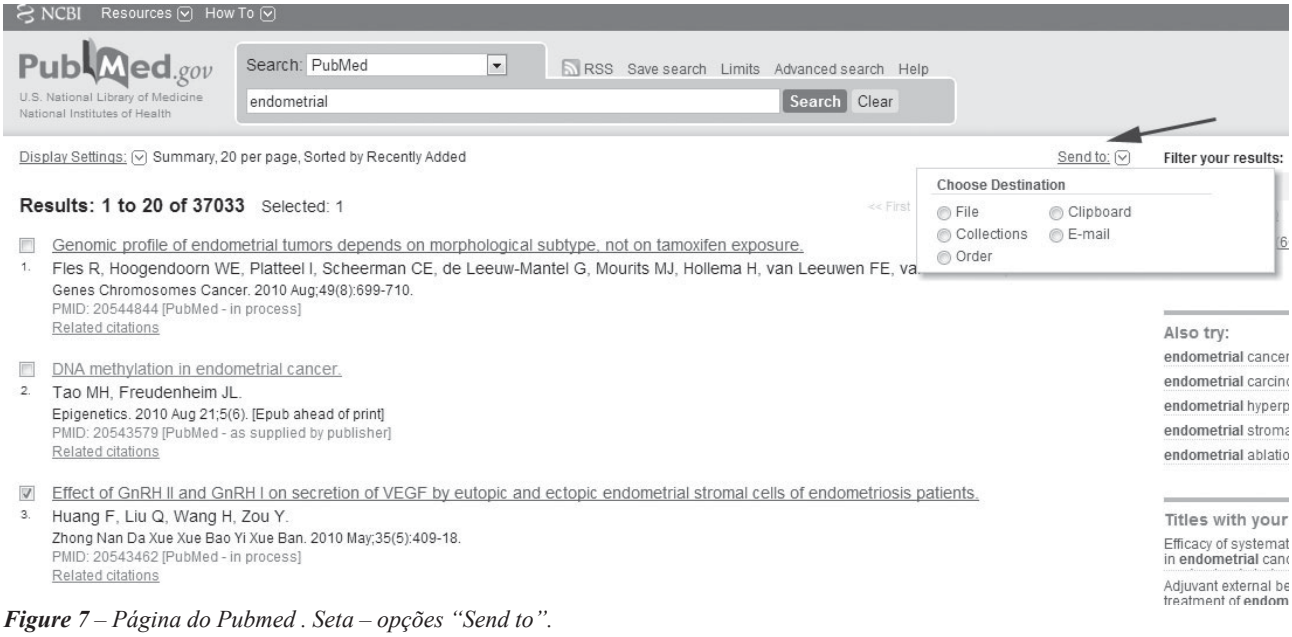

Figure 7 *– Página do Pubmed . Seta – opções "Send to".*

Outros sites que disponibilizam textos científicos são o da BIREME (http://regional.bvsalud.org/php/index.php) onde há links para o SCIELO (www.scielo.org) e a biblioteca Cochrane (www.cochrane.org). A Cochrane disponibiliza integralmente as metanálises de ensaios clínicos, situadas no topo em termos de qualidade de evidência científica. São mais de 400 mil ensaios clínicos fazendo parte de seu acervo de metanálises, as quais são feitas por seus colaboradores divididos em grupos de diversas áreas. O Scielo disponibliza textos completos de periódicos da América Latina, Espanha e Portugal. Existem comandos de busca semelhantes ao do PubMed para achar os resumos nestas bases, mas não necessariamente iguais, o que está fora do escopo deste texto.

O EMBASE (www.embase.com) disponibiliza estudos da área da biomedicina e farmacologia com ênfase em ensaios clínicos de drogas.

O UpToDate Online é uma base de revisões baseadas em evidências realizadas por mais de 3800 experts nos diversos temas atualizadas frequentemente e que permitem uma busca rápida de respostas dos mais diversos temas. Sua função é sintetizar as informações dos estudos para os clínicos e estudiosos que não têm tempo para ler tudo acerca de um determinado tema.

O PERIODICOS-CAPES (www.periodicos.capes.gov.br) é disponível em várias instituições de ensino brasileiras e é uma ferramenta muito útil. Este *site* permite o acesso a inúmeros artigos de qualidade. Oferece acesso ao texto completo de mais de 11 mil publicações periódicas nacionais e internacionais dos mais diversos temas (não só da saúde, mas da engenharia, astronomia, etc..). Após acessar uma das revistas, existe um campo search que pode ser usado para procurar os termos em todos os jornais disponíveis. Costuma ser gratuito em bibliotecas das universidades.

Com um grande domínio do mercado de buscas na internet, o Google disponibilizou um recurso para artigos científicos, o Google Scholar (www.scholar.google.com). Tem a vantagem de ser acessível a todos, embora os artigos demonstrados nos resultados possam não ser disponíveis por inteiro. Tem como desvantagem, trazer muita informação, nem todas confiáveis.

Após a seleção inicial dos artigos, o profissional deve ter o discernimento para filtrar os melhores que vão merecer uma leitura mais detalhada. Deve-se começar pela sessão de materiais (ou pacientes) e métodos. É neste local que o leitor deve avaliar a qualidade do trabalho e averiguar se compensa a leitura por completo. De nada adianta tomar conhecimento dos resultados e conclusões de um estudo que tem falhas grosseiras de metodologia científica, ou seja, se você resolver desprezar um artigo deve fazê-lo antes de ler os resultados.

Existem quatro pontos fundamentais num bom trabalho científico, a saber: 1- desenho (montagem) adequado do estudo 2- qualidade na obtenção dos dados 3- análise (estatística) correta dos dados e 4- conclusões pertinentes com a análise dos dados. A falha nos dois primeiros itens (erros sistemáticos) é fatal para um bom estudo, pois sempre existe a possibilidade de se reanalisar os dados (estatisticamente) e de se mudar conscientemente as conclusões, porém não se consegue remontar um estudo que foi mal elaborado desde o início ou no qual os dados foram colhidos precariamente.

Em primeiro lugar deve-se analisar que tipo de estudo foi realizado. Pode-se dividir em quatro grandes grupos, em ordem crescente de melhor evidência científica: 1- relato e série de casos; 2- estudos observacionais (longitudinal prospectivo "coorte"; longitudinal retrospectivo "caso-controle"; transversal (p.ex. censo, questionários)); 3- estudos experimentais (estudos clínicos randomizados e controlados); 4 – revisões sistemáticas e metanálises (procuram reunir os trabalhos de melhor qualidade metodológica e fazer uma síntese da melhor evidência disponível). No próximo artigo serão analisados os relatos e série de casos.

Como pudemos notar neste texto, a disseminação do conhecimento científico não depende só da disponibilidade de boas revistas e artigos, mas também de muito treino para obtê-lo.

LEITURA COMPLEMENTAR

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Original Article

Laparoscopic Totally Extraperitoneal Inguinal Hernia Repair: Nonfixation of Three-Dimensional Mesh

Reparo da hérnia inguinal por laparoscopia totalmente extraperitoneal

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ABSTRACT

Background: Laparoscopic totally extraperitoneal (TEP) repair is preferred over transabdominal preperitoneal hernia repair (TAPP) as the peritoneum is not violated and there are fewer intra-abdominal complications. This is undoubtedly the most elegant technique, but more difficult to perform. The purposes of this study were to describe and discuss our techniques and the modifications of using 3-D mesh in TEP inguinal hernia repair. **Methods**: Patients who underwent an elective inguinal hernia repair at the Department of Abdominal Surgery at the CHICAS (Centre Hospitalier Intercommunal des Alpes du Sud), Gap, France and Department of Surgery, Professor Edmundo Vasconcelos Hospital, São Paulo, Brazil between May and December 2009 were enrolled retrospectively in this study. Operative and postoperative course were studied. **Results**: A total of 39 hernia repairs were included in the study. The hernias were repaired by TEP technique. Mean operative time was 45 min in unilateral hernia and 62 min in bilateral hernia. There were no serious complications. **Conclusion**: According to our experience, in the hands of experienced laparoscopic surgeons, TEP has an acceptably low complication rate. Laparoscopic hernia repair seems to be the favoured approach for most types of inguinal hernias. However, the patient must be told about the possible complications.

Key words: Laparoscopic surgery. Inguinal hernia. Surgical mesh.

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INTRODUCTION

The inguinal hernia repair has been a controversial area in surgical practice ever since it was conceived.[1] The fact that numerous different procedures are in use reflects the complexity of inguinal instability and its repair. The aim of hernia repair is to repair the weakness of the abdominal wall. The laparoscopic procedure is the only technique that allows us not to injure the abdominal wall. In the laparoscopic procedure, the repair is achieved by placement of a prosthetic mesh to cover the entire groin area, including the sites of direct, indirect, femoral and obturator hernias. The totally extraperitoneal procedure (TEP) combines the advantages of tension-free mesh reinforcement of the groin with those of laparoscopic surgery, reduces postoperative pain and shortens recovery time while avoiding the need for a transabdominal approach.[2] The establishment of this technique by Dulucq in Europe may be considered a logical further development of transabdominal preperitoneal hernia repair (TAPP).[3,4] The surgeon can use the endoscopic inguinal hernia technique for the repair of a primary hernia, providing the surgeon is sufficiently experienced in the specific procedure.[5]

In this paper we will evaluate the technique for laparoscopic hernia repair. This retrospective review will evaluate the safety and effectiveness of this repair. We discuss the changes to the operative technique that helped reduce complication rates and present reasons for continuing to utilize the laparoscopic approach. We describe and discuss our techniques and the modifications when using 3-D mesh in laparoscopic totally extraperitoneal (TEP) inguinal hernia repair.

MATERIALS AND METHODS

Patients who underwent an elective inguinal hernia repair at the Department of Abdominal Surgery, CHICAS, Gap, France and at the Department of Surgery, Professor Edmundo Vasconcelos Hospital, São Paulo, Brazil between May and December 2009 were enrolled retrospectively in this study. We evaluated subjects for inclusion in a consecutive series of 39 laparoscopic hernia repairs who had undergone the TEP procedure. The protocol of this study was approved by the Medical Ethics Committees of Professor Edmundo Vasconcelos Hospital and CHICAS.

SURGICAL TECHNIQUE

- Preoperative preparation

The TEP is performed under general anesthesia and with the administration of a single dose of antibiotic prophylaxis (cephalosporin: 2g cefazolin). The patient urinates just before the surgery. The patient is placed in the supine position; the arm is set along the body on the side opposite the hernia. The surgeon stands on the side opposite the hernia. The patient is placed in a slight Trendelenburg position.

- The operation step 1: extraperitoneal access

A Veress needle is first inserted in the midline just above the pubis in the suprapubic space of Retzius. We use three trocars in the midline. A infraumbilical transverse incision is made. A 10-mm trocar is inserted in the subcutaneous plane in a horizontal direction, then slowly lifted up and introduced at an angle of 60^0 towards the sacrum.

- The operation step 2: dissection of the preperitoneal space

The laparoscope is introduced through the infraumbilical port and the preperitoneal space is visualized. We use the 0° laparoscope for the preperitoneal dissection. The insufflation continues with a pressure set at no higher than 12 mmHg. One hand holds the optic, the other leans on the abdominal wall. It is a question of balance between left and right.

- Medial dissection

With the laparoscope the surgeon creates a medial tunnel. There are three essential anatomic landmarks: 1 the pubic bone, 2 the arcuate line, 3 the inferior epigastric vessels. The first step is to identify the pubic bone which appears as a white glistening structure in the midline. The second anatomical key is the arcuate line on the side. The third anatomical key is the inferior epigastric vessels. Under direct visualization two 5 mm trocars are placed in the midline: one just above the pubis and the other between the first two trocars. In the case of direct hernia, the hernial sac is visualized before the inferior epigastric vessels. In the indirect hernia, the inferior epigastric vessels are seen before the hernial sac is encountered.

- Lateral dissection

This is the time to dissect the lateral space. The passage to do the lateral dissection is in the angle between the arcuate line and the inferior epigastric vessels. If the arcuate line extends lower, a short incision (scissors without coagulation) must be made in it to ensure safe and adequate dissection.

The lateral dissection is done all the way up to the psoas muscle inferolaterally, thereby exposing the nerves in the « lateral triangle of pain ».[6] The lateral space contains loose aerolar tissue, which is completely divided using blunt dissection.

- The operation step 3: hernia dissection

The hernia is completely dissected from the cord structures and reduced. Next. the peritoneal sac with reflection is completely reduced. The vas deferens is seen lying separately on the medial side and gonadal vessels are seen on the lateral side forming a triangle. This triangle, known as « triangle of doom » is bounded medially by the vas deferens, laterally by gonadal vessels with its apex at the internal inguinal ring, and the base is formed by the peritoneum.[6]

- The operation step 4: placement of the mesh

The 3-D anatomically contoured polypropylene mesh (Microval; Malmont, France) is introduced through the 10-mm infraumbilical port. The mesh is placed over the space created for it to cover the sites of direct, indirect, femoral and obturator hernias (Figure 1). The mesh must be large enough - measuring at least 10 x 14 cm - for the hernial ring to be nearly in the middle of the mesh.[5] A good mesh must be supple and easy to place. In the bilateral hernia, it's easier to place two meshes instead of placing one large piece of mesh. Thanks to the anatomical mesh, stapling is no longer necessary.[7] To avoid possible

damage to nerves, staple fixation of the meshes is used only in exceptional cases involving a highly enlarged internal ring. In this case the mesh is only stapled medially and to the Cooper's ligament to avoid neuralgia.[8]

- The operation step 5: the deflation process

The deflation process happens under direct visualization, the hernial sac and lipoma are placed behind the mesh. The extraperitoneal space is then inspected for haemostasis, the abdomen desufflated, and the skin incisions are then closed. During the deflation process, repositioning of the peritoneal sac on the mesh, in particular the dorsal edge of the latter, is carefully performed to avoid displacement or folding of the mesh. We don't use any drainage.

- Postoperative course

The operation can be performed in a day surgery unit.[9] Ambulatory surgery appears to have benefits in terms of organization and economics. The hospital charges are lower for ambulatory surgery, and the ambulatory surgery keeps inpatient resources available for complex cases and emergencies. A technique without ballon dissection, without stapling and in ambulatory surgery is less expensive.[10]

RESULTS

We performed 39 laparoscopic TEP repairs with 3-D mesh under general anaesthesia between May and December 2009. All of these patients were male, with a mean age of 52.3 years. Eighteen percent of the hernias were recurrences after conventional repair. The median ASA grade was 2, with 46% of them having one or more comorbidities. Hernia characteristics are shown in table 1.

Mean operative time was 45 min in unilateral hernia and 62 min in bilateral hernia. The mean hospital stay was 1.3 days. A total of three complications occurred (8%), including two patients with seroma formation and one scrotal haematoma. All these complications were managed conservatively. There were no serious complications, conversion to open procedure or perioperative mortality. The median follow-up period was 6 months (2-9 months). There was no recurrence of hernia within this early postoperative period.

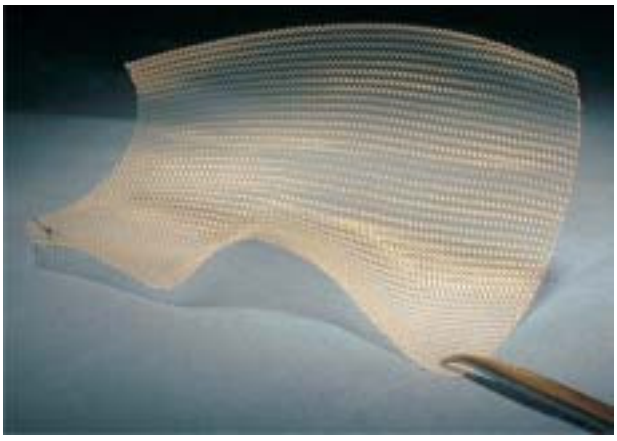

Figure 1 – *The configuration of a right-sided 3-D mesh (Microval; Malmont, France).*

DISCUSSION

Laparoscopic hernia repair has several advantages over conventional open methods as shown by prospective randomized trials comparing laparoscopic to tension-free open herniorrhaphy.[11] The major advantages include less postoperative pain, earlier return to normal activities and work, better cosmetic results and cost effectiveness.[12,13]

Laparosocopic inguinal hernia repair require the acquisition of technical skills. A learning curve of at least 40 cases is necessary to reduce the rate of complications and recurrences.[14] It is currently thought that all recurrences appear within the first 2 years of follow-up. One of the ways to shorten the learning curve and minimize the recurrence rate is to refine the techniques in a major center.

Historically, cost analysis favored open hernia repair over laparoscopy. However, with more than a decade of experience in laparoscopic hernia repair

Table 1 - Hernia characteristics.

Variable	No. (%)
Site of hernias	
Right	19 (49%)
Left	15 (38%)
Bilateral	5 (13%)
Types of hernias	
Direct	10 (26%)
Indirect	21 (54%)
Femoral	1 (2%)
Recurrent	7 (18%)

and the dissemination of knowledge to all regions, costs have fallen are are now comparable to open repair.[15,16]

Intraoperative major complications are rarely seen in hernia surgery. A more common intraoperative complication encountered with TEP and TAPP is injury to the bladder (0%-0,2%), mainly in patients with previous suprapubic surgery. Studies on TEP and TAPP report intraoperative bowel injury in 0% to 0,3% of cases, with rates of 0% to 0,06% in large investigations involving considerably more than 1000 patients, and damage to major vessels at rates of 0% to 0,11%.[17]

Problems may arise if the patient is not in the Trendelunburg position. In this case, the bowel may stay in the hernia and the risk of bowel diathermy injury increases. The laparoscopic extraperitoneal repair is performed under general anesthesia with a good curarization, otherwise the workspace is too small. The dissection must always be done with the same steps, for the technique to be reproductible. During the dissection, the surgeon must see the spider's web aspect to indicate that he is in the right direction.

Injury to these vessels can be fatal and usually requires an urgent laparotomy and vascular repair. Patients with unrecognized bowel injuries generally present 3-7 days after injury with complains of fever and abdominal pain. However, reported intervals from time of occurrence of injury to onset of symptoms vary from 18h to 14 days.[18,19] There were no postoperative complications in our patients. Since our follow-up was relatively short, our results may apply mainly to the operative and early postoperative courses.

One of the debates about the TEP techniques is whether stapling is necessary. Staples could induce damage to sensory nerves leading to disabling neuropathies.[20] In a case-control study comparing selective non-stapling against stapling for TEP hernioplasty, there was no hernia recurrence over a medium follow-up period of 1.4 years.[21] In a randomized clinical trial comparing fixation vs nonfixation of mesh there were no clinical advantages and fixation increases the cost.[22] We think that not stapling can shorten both the learning curve and operating time.

We used three-dimensional (3-D) anatomically contoured polypropylene mesh (Microval ; Malmont, France) for the reinforcement of the inguinal region. As the 3-D mesh conforms to the contour of the inguinal region, the possibility of mesh migration is minimal. We concur that it is large enough to cover all hernia spaces and proved to be favorable for laparoscopic handling.

TEP hernioplasty is an advanced laparoscopic procedure. Relative contraindications include patients unfit for anesthesia, obesity, large hernia, pregnant patients, patients with a history of lower abdominal surgery, recurrent hernia after laparoscopic hernia repair, and patients receiving anticoagulant treatment. We only operate symptomatic hernias.[23]

CONCLUSION

Laparoscopic hernia repair is our favorite technique. TEP is preferred over TAPP as the peritoneum is not violated. However the dissection must always be done with the same stages, without monopolar diathermy, and the patient in a slight Trendelenburg position. With these tips, the TEP hernioplasty is feasible with fewer intra-abdominal complications. The patient must be advised about the possible complications.

RESUMO

***Revisão**: O reparo por laparoscopia totalmente extraperitoneal (TEP) é preferível ao reparo da hérnia pré-peritoneal transabdominal (TAPP) considerando que o peritôneo não é atingido e existem poucas complicações intra-abdominais. Esta é sem dúvida a melhor técnica, porém a mais difícil de se executar. O objetivo deste estudo foi descrever e discutir nossas técnicas e modificações utilizando a tela 3-D no reparo da hérnia inguinal por TEP. **Métodos**: Pacientes que participaram no reparo eletivo da hérnia inguinal do Departamento de Cirurgia Abdominal do CHICAS (Centro Hospitalar Intercomunal dos Alpes do Sul), Gap, França e do Departamento de Cirurgia, Hospital Professor Edmundo Vasconcelos, São Paulo, Brasil no periodo de maio a dezembro de 2009 foram incluídos neste estudo retrospectivamente. A evolução cirúrgica e pós-cirúrgica foram estudas. **Resultados**: Um total de 39 reparos de hérnias foram incluídas neste estudo. As hérnias foram corrigidas pela técnica TEP. A média de tempo cirúrgico foi de 45 min na hérnia unilateral e 62 min na hérnia bilateral. Não ocorreu nenhuma complicação séria. **Conclusão**: De acordo com a nossa experiência, nas mãos de cirurgiões laparocópicos experientes, a TEP obteve poucas e aceitáveis taxas de complicações. O reparo da hérnia laparoscópica parece ser a modalidade preferível para a maioria dos tipos de hérnias inguinais, o paciente deve ser advertido sobre as possíveis complicações.*

***Descritores**: Cirurgia laparoscópica, hérnia inguinal, tela cirúrgica.*

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Original Article

Evaluation of Health-Related Quality of Life (HRQL) in Patients with Gastroesophageal Reflux Disease (GERD) Before and After Nissen Fundoplication Surgery

Avaliação da Qualidade de Vida no Pré e Pós-Operatório dos Pacientes com Doença do Refluxo Gastroesofágico (GERD) Submetidos à Cirurgia de Fundoplicatura à Nissen

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ABSTRACT

Objectives: Evaluate quality-of-life in patients with Gastroesophageal Reflux Disease (GERD) before and after Nissen fundoplication surgery. **Materials and Methods**: Eighteen patients with GERD refractory to medical management underwent Nissen fundoplication surgery between June 2006 and December 2007. All surgeries began laparoscopically. The Gastroesophageal Reflux Disease – Health-Related Quality of Life (GERD-HRQL) questionnaire was the instrument used to evaluate quality-of-life. The questionnaire was administered under the supervision of the same interviewer at the time of hospitalization and 90 days after surgery, during outpatient follow-up or by telephone. **Results**: For all the questions in the questionnaire – except those related to dysphagia – there was a statistically significant ($p<0.05$) reduction in the post-operative averages in relation to the preoperative averages. Averages of the sum of the 10 questions were 27.1 ($\pm$6.61) pre-operatively and 6.61 ($\pm$2.27) post operatively. The difference between the means was statistically significant ($p<0.05$), consistent with an improvement in symptomatology after surgical treatment. **Conclusions**: Laparoscopic or open Nissen fundoplication surgery, in addition to correcting the pathophysiologic defects of GERD, demonstrated its ability to provide patients with this disease with a significant improvement in symptomatology and quality-of-life.

Key words: Fundoplication. Gastroesophageal reflux. Quality of life. Hiatal hernia.

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INTRODUCTION

Gastroesophageal Reflux Disease (GERD) affects 40% of the adult population,[1, 2] and is frequently responsible for high rates of morbidity and for considerable impact of the quality of life of the patient. This impact, in some circumstances, is greater than that caused by diseases such as diabetes mellitus, arterial hypertension, acute myocardial infarct and arthritis.[2-4] The treatment of this condition includes lifestyle and diet modification, pharmacotherapy – today considered the first line of treatment – and surgery.[5]

In the past, anti-reflux surgery was performed primarily to treat complications of GERD, such as hemorrhages and stenoses.[1] With the advent of fundoplication via videolaparoscopy in 1991,[5-7] however, surgical treatment has been indicated with increasing frequency. Objective endoscopic, manometric, and pH criteria suggest that laparoscopic fundoplication is capable of restoring the physiologic anti-reflux barrier and, thereby, control of chronic gastroesophageal reflux in 95% of casos,[8] with low rates of morbidity and mortality.[5, 9, 10] It has been observed that these objective parameters don't always correlate with patient satisfaction or with an improvement in the quality of life and symptomatology. For this reason, the evaluation of quality of life provides information that complement the traditional objective criteria,[2, 11, 12] and thus in recent years has been considered an important factor in the strategies for the treatment of the disease.

The objective of the study is to evaluate the impact of Nissen fundoplication surgery, via open or videolaparoscopic technique, on the quality of life of patients with Gastroesophageal Reflux Disease refractory to medical management.

METHODS

Patients

Eighteen patients of both sexes with gastroesophageal reflux disease (GERD) refractory to clinical treatment and who underwent Nissen fundoplication surgery between June 2006 and December 2007 were enrolled. The study was approved by the Institutional Ethics Committee. All subjects were 18 or older and agreed to participate in all steps of the study.

Surgery

The procedure was performed by the General Surgery service of the institution. All surgeries were initiated laparoscopically.

Data

Research data were obtained by medical record abstraction and by interview. Quality of life was assessed using the Gastroesophageal Reflux Disease – Health Related Quality of Life (GERD-HRQL) questionnaire.[13, 14] Developed by Velanovich and cols., the GERD-HRQL consists of 10 questions that specifically address GERD symptoms – each scored on a 0 to 5 scale – and an additional question which evaluates the patient's satisfaction with his or her current condition (Table 1). The best possible aggregate score is 0 (absence of symptoms), and the worst is 50 (very severe symptoms).[15] The questionnaire was administered by the same interviewer upon admission to the hospital and 90 days after the surgery, during an outpatient visit or by telephone.

Statistical Analysis

The data was analyzed using the EPI-INFO statistical program. Values with a $p < 0.05$ were considered statistically significant.

Table 1 - *The GERD-HRQL questionnaire.*

Scale
0. No symptoms
1. Symptoms noticeable, but not bothersome
2. Symptoms noticeable and bothersome, but not every day
3. Symptoms bothersome everyday
4. Symptoms affect daily activities
5. Symptoms are incapacitating- unable to do daily activities
Questions
1. How bad is your heartburn?
2. Heartburn when lying down?
3. Heartburn when standing up?
4. Heartburn after meals?
5. Does heartburn change your diet?
6. Does heartburn wake you from sleep?
7. Do you have difficulty swallowing?
8. Do you have pain with swallowing?
9. Do you have gassy or bloating feelings?
10. If you take medication, does it affect your daily life?
How satisfied are you with your present condition?
❑ Satisfied ❑ Neutral ❑ Dissatisfied

RESULTS

Eighteen patients participated in the study: fifteen (83.3%) women and three (16.6%) men. The average age was 58.2 years (20-74 years). All patients had a history of episodes of heartburn prior to the surgery, and 15 (83.3%) reported intermittent or persistent reflux for average period of 6.3 years (1 – 20 years). Only one (5.5%) patient reported dysphagia. With regard to atypical symptoms, 4 (22.5%) patients reported chronic cough and 2 reported hoarseness (11%). Endoscopic and radiologic findings were as follows: 15 patients (83.5%) had sliding hiatal hernia, with a average size of 5.0 cm (2 – 15 cm). One patient, who had undergone videolaparoscopic fundoplication surgery five years earlier, was found on endoscopic exam to have a voluminous post-operative hernia. Nine patients (50%) had esophagitis, which was rated according to the Savary-Miller classification as follows: 4 grade I, 4 grade II e 1 grade III. Lesions suggestive of Barrett's esophagitis were observed in three patients, all subsequently confirmed by anatomic pathology examination.

All patients underwent Nissen fundoplication surgery. All surgeries were initiated laparoscopically, but in four patients (22.5%) conversion was necessary because of technical difficulties during the procedure. A 360° valve was fashioned in all patients, with an average size of 2.5 cm (2-4). Average surgical time was 152 minutes (90-240).

With the exception of questions 7 and 8, which relate to symptoms of dysphagia, for all of the questions of the GERD-HRQL questionnaire, there was a statistically significant ($p<0.05$) reduction in the mean post-operative measures in relation to the pre-operative mean. The average of the sum of the ten questions was 27.1 ($\pm$6.61) pre-operatively and 6.61 ($\pm$2.27) post-operatively. The difference between the means was statistically significant ($p<0.05$), reflecting an improvement in symptomatology of the patients after surgical treatment. All were dissatisfied with their condition in the pre-operative period. In the post-operative period, all reported that they were satisfied with the results.

DISCUSSION

Gastroesophageal Reflux Disease is considered an important public health problem. The vast majority of patients have periodic mild symptoms. In a small proportion, the gastroesophageal reflux causes intense symptoms and may evolve to complications such as severe esophagitis, esophageal stenosis, Barrett's metaplasia, and adenocarcinoma of the esophagus.[16, 17] Dent and cols.[18, 19] state that "reflux disease may be present when heartburn occurs two or more days per week, based on the negative impact the frequency of this symptom has on health-related well-being". In recent years, various studies have demonstrated that with GERD, both clinical and surgical treatments are capable of significantly improving patients' symptomatology and quality of life.[18,20-24] Nevertheless, some studies have shown that patients who have undergone laparoscopic fundoplication have better symptom control, and are more satisfied and have better global improvement of measures of quality of life as compared with those treated with nonsurgical methods.[15]

The GERD-HRQL questionnaire used in this study demonstrated its ability to evaluate satisfactorily the results obtained with surgical treatment. The outcome measures traditionally used to assess the prognosis of a surgical treatment are morbidity and mortality rates, length of hospital stay, complications and resolution of symptoms.[25] A successful operation, therefore, should eliminate typical symptoms and minimize the short and long-term post-operative complications, and have biochemical, physiological, and clinical parameters that are reproducible. For the patients, however, these results rarely are important. Their priorities are a perception of health and well-being.[26] In recognition of these differences, the need for an evaluation of quality of life has been mentioned in the various consensus documents.[8,27,28] Velanovich[13] compared one instrument specific for GERD developed by him (the GERD-HRQL) to a generic scale that evaluates quality of life (the SF 36), and found that only the GERD-HRQL was able to predict the patient's satisfaction with the outcome of the fundoplication.[1] It is suggested, therefore, that this questionnaire is more responsive to the effects of treatment and more sensitive to changes in symptoms.[13, 29]

Significant improvement of quality of life is observed in patients after fundoplication surgery. Various authors corroborate this result, with success rates exceeding 80%.[1, 2, 8, 17, 25, 26, 30] Kamolz and cols. argue that the improvement in symptoms related to GERD is the principal expectation of patients who undergo surgical treatment.[18] Still, some of patients remain oligosymptomatic. Several studies have shown that symptoms related to stress in patients with GERD,

various comorbidities such as psychiatric disorders, dyspepsia, or aerophagia, can affect the results of the surgery even when the physiologic correction is successful.[2, 18, 31-34] All these studies show that the relief of GERD and improvement in quality of life are more complex than simply the rectification of the underlying pathophysiology of the disease.[35] Contini and cols.[25] further argue that "pre-operative functional dyspepsia, which is not affected by fundoplication[2], or inadequately rigorous selection of the patients – whose symptoms may be unmasked by the surgery – contribute to suboptimal results". In this context, Slim and cols.[2] affirm that dyspeptic symptoms are considered one of the contra-indications for anti-reflux surgery in the absence of documented GERD.

Among all the issues, the greatest impact of the surgery was observed in relation to the use of medications for the control of symptoms of the disease. Nevertheless, according to Madan and cols.[36], despite high levels of satisfaction with the results of surgical treatment, 80% of patients continue to or return to using proton pump inhibitors over the medium to long term. Additional studies, conducted for longer periods, will be necessary in order to verify this assertion.

In contrast with the typical symptoms, no improvement in dysphagia was observed after surgical treatment. Pre-operative dysphagia is present in up to 20% dos patients who undergo surgery for GERD, and it is believed that dysphagia is related to the presence of hypersensitivity to acid, hiatal hernia, and altered peristalsis.[6, 37-39] Moreover, this symptom is common in the early postoperative period, and appears to be slightly more frequent in total as compared with partial fundoplication.[37] Still, approximately 80% of the patients recover the ability to eat normally after the second week. Overall, in a study carried out by Fumagalli and cols.,[37] only 3.3% of patients required treatment for this condition, and two-thirds of these were successfully treated with endoscopic dilatation.

A high prevalence of hiatal hernia (83.5%) was observed in our study sample. The role of hiatal hernia in GERD is still controversial. Still, the weight of current epidemiologic and physiologic data supports its importance in patients with more severe presentations of esophagitis, peptic stenosis, or Barrett's esophagus.[40] Moreover, Fass and cols.[41] affirm that the absence de hiatal hernia, as well as female gender and younger age, are associated with non-erosive reflux disease and, therefore, milder forms of the disease. Accordingly, the high prevalence of this condition in the sample may explain, in part, the refractoriness of symptoms to medical management, which is one of the inclusion criteria for patients entering this study.

CONCLUSION

Open or laparoscopic Nissen fundoplication surgery, in addition to correcting the pathophysiologic defects of GERD, has demonstrated it ability to provide patients who suffer from the disease a significant improvement in symptomatology and in quality of life. It can, therefore, be performed safely and with results that are acceptable to those patients refractory to medical management and in those unsatisfied with their present condition.

RESUMO

***Objetivos**: Avaliar a qualidade de vida de pacientes portadores de Doença do Refluxo Gastro-Esofágico (GERD) antes e após a fundoplicatura à Nissen. **Materiais e Metodos**: Participaram do estudo 18 pacientes portadores de GERD refratários ao tratamento clínico e que foram submetidos à cirurgia de fundoplicatura à Nissen entre junho de 2006 e dezembro de 2007. Todas as cirrgias foram iniciadas por via laparoscópica. Utilizou-se como instrumento de avaliação da qualidade de vida o questionário GERD-HRQL (Gastroesophageal Reflux Disease – Health Related Quality of Life). O questionário foi aplicado aos pacientes sob supervisão do mesmo avaliador no momento da admissão hospitalar e 90 dias após a cirurgia, durante retorno ambulatorial ou através de telefone. **Resultados**: Em relação ao questionário, observou-se em todas as questões uma redução estatisticamente significativa (p<0,05) nas médias pós-operatórias em relação às pré-operatórias, com exceção das questões que se referem a symptoms disfágicos. As médias da soma de todas as questões no pré e no pós-operatório foram, respectivamente, 27,1 (±6,61) e 6,61 (±2,27). A diferença entre as mesmas apresentou significância estatística (p<0,05), traduzindo melhora nos sintomas dos pacientes após o tratamento cirúrgico. **Conclusões**: A cirurgia de fundoplicatura a Nissen, aberta ou laparoscópica, além de corrigir os defeitos fisiopatológicos da GERD, provou-se capaz de proporcionar aos pacientes portadores da doença uma melhora significativa na sintomatologia e na qualidade de vida.*

***Descritores**: Fundoplicatura. Refluxo Gastroesofágico. Qualidade de Vida. Hérnia Hiatal.*

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Original Article

Duodenal Exclusion Associated with Truncal Vagotomy as a treatment for Type II Diabetes Mellitus in patients with BMI between 26 and 38 kg/m²: Preliminary Results

Exclusão Duodenal Associada à Vagotomia Troncular como Tratamento para o Diabetes Melito Tipo 2 em Doentes com IMC entre 26 e 38 Kg/m²: Resultados Preliminares

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ABSTRACT

Type II Diabetes Mellitus (DM2) affects a great part of the obese population, but can also be diagnosed in those who are non-obese or even thin. Bariatric surgery stands out among the mechanisms that are proposed as cures for diabetes. In the surgery community, duodenal exclusion has been the focus of large studies, and has shown satisfactory results both in obese patients and in thin patients. The objective of the present study was to evaluate the efficacy of this technique associated with truncal vagotomy, aiming in this way of offering both a solution for DM2 and a reduction in body weight and improvement of the complications caused by both. This procedure was carried out 10 patients of both sexes with DM2, with ages between 40 and 65, and a BMI < 39 kg/m². The preliminary results through 3 months post-surgery were the reduction of serum glucose, reduction in body weight, and improvement in blood pressure and the lipid profile. It is believed that the critical component for the reduction of serum glucose was the duodenal exclusion of the passage of nutrients. As occurs with vagal blockade, weight loss is also expected with truncal vagotomy. The patients developed early satiety and reduction in the quantity of caloric intake. Based on the preliminary results we concluded that duodenal exclusion associated with truncal vagotomy is an effective technique for the treatment of DM2, and that the C-peptide levels predict its success, because the patients with the highest levels responded better to the treatment. Nevertheless, we must await the end of the present study for any definitive conclusions.

Key words: Type 2 diabetes mellitus. Duodenal exclusion. Truncal vagotomy.

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INTRODUCTION

Type II diabetes mellitus (DM2) – representing about 90% to 95% of all cases of diabetes mellitus – is a disease comprised of disturbances in the metabolism of carbohydrates, fats, and proteins, caused by alterations in the secretion of insulin in target tissues, characterized by a state of chronic hyperglycemia.[1]

Its pathogenesis involves genetic factors and environmental factors, which encompasses lifestyles, including physical inactivity, a diet that is not balanced associated with excess weight and, consequently, a body mass index higher than that considered healthy.[2, 3]

As mentioned above, excess weight (obesity) is considered an important risk factor for the development of DM2. This is due to its association with metabolic syndrome, which is also responsible for various other complications including hypertension and dyslipidemia.[4, 5]

Of the total percentage of the population with diabetes, it is estimated that 35% to 50% of individuals

do not know they have the disease, a fact which contributes to the early development of micro- and macrovascular complications, setting the stage for conditions such as chronic renal insufficiency, cerebrovascular accident, coronary artery disease, cardiomyopathy, among other complications responsible for the mortality and morbidity of these diseases.[6]

Diabetes mellitus becomes more complex the closer we get to normal indices of weight. The diabetic that is morbidly obese has clear resistance to insulin caused by the adipose that is accumulated in the body. In the thin diabetic, the factors which bring about the disease clearly are not related to an excess of fat, but the reason that insulin resistance is established in these patients has not been elucidated.[7]

Because of the extensive number of complications that can arise from DM2, this disease – when inadequately controlled – represents a considerable economic burden for the patient and for society. It has shown that such complications can be reduced when the hyperglycemia, hypertension, and dyslipidemia than are generally associated with DM2 are controlled.[4, 8]

Various approaches to achieve this objective have been proposed, among them one that has received considerable attention is bariatric surgery in morbidly obese patients, which can prevent or cure DM2.[9]

Operations for obesity are classified as:

i. disabsorptive techniques, which interfere with food absorption and are effective in reducing body weight and in improving insulin sensitivity; ii. restrictive techniques, which limit stomach capacity; these have been largely abandoned due to the tendency of patients to regain the weight and less consistent metabolic results; iii. mixed techniques, which combine restrictive and disabsorptive techniques. [10, 11]

Interestingly, all bariatric surgeries demonstrate notable impact on DM2, although with different degrees of efficacy. Two techniques stand out as the most effective: the Roux-en-Y gastric bypass, which is considered a mixed technique, and the Biliopancreatic Diversion, a disabsorptive technique which promotes normal concentrations of glucose, insulin, and glycosylated hemoglobin in 80% to 100% of morbidly obese patients operated in this fashion.[12]

Although the weight loss is directly related with changes in the sensitivity to insulin and to the level of glucose in the blood, it has been observed that after the operation, glycemic control is frequently attained within days after the procedure, well before there has been significant weight loss. Based on this fact, it has been suggested that the laboratory improvement in DM2 could be a direct effect of anatomic and functional alterations provoked by the surgery and not solely by weight loss. To explain this effect, HICKEY and cols.[15] propose two hypotheses. The first is that the reduction in food intake immediately after the surgery could be responsible for this improvement. The second hypothesis is that the exclusion of part of the gastrointestinal tract, which possesses an important endocrine activity, would be the mechanism responsible for rapid glycemic control.[13, 14, 15]

Based on these data, it is believed that similar results should occur in patients with DM2 who are not morbidly obese.

With a study carried out in rats, RUBINO[16] proposed that the mechanism responsible for the improvement of DM2 would be the exclusion of the duodenum, because the exclusion of this region stimulates the intestine to secrete a substance which acts on the pancreas, improving its function and with this impacting positively on diabetes mellitus.

In 2007, COHEN and cols.[9] conducted a study about the efficacy of this procedure that preserves the anatomy of the stomach in humans with DM2 and who had a body mass index between 22 and 34 Kg/m². These authors had a satisfactory result in terms of glycemic control by the fifth postoperative week.

In the present study truncal vagotomy associated with duodenal exclusion in a Roux-en-Y similar to that performed in the biliopancreatic diversion with duodenal switch procedure will be performed. Vagotomy consists of the sectioning of the vagal nerves in order to reduce peptic hydrochloric acid secretion of the stomach.[17]

The idea for this association arose from review of two studies. One of them[18] evaluated the effect of vagal blockade on caloric intake, satiety during meals and satiety between meals; and in the other study[19] the safety and effectiveness blockade on excess weight was assessed. The first study found an increase in satiety between meals, a decrease in the eating capacity during meals, and a lower level of calories ingested. In the second study, results were also satisfactory, and the vagal blockade was considered a safe and beneficial procedure for those who are overweight.[18, 19]

Based on these data it is believed that with truncal vagotomy it will be possible to obtain results similar to those attained with vagal blockade.

Parameters considered important for indicating the surgery for control of DM2 include plasma level of C peptide used to assess the secretory capacity of the pancreas, and the plasma levels of anti-GAD (anti-glutamic acid decarboxylase), which should be within normal limits, or in other words, not have identified the presence of a autoimmune process in patients considered to have DM2.[7, 20]

The present study seeks to evaluate the effects of duodenal exclusion associated with truncal vagotomy on DM2 and excess body weight, and also investigate if the levels of C peptide are important factors for performing the surgery.

METHODS

Patients

Ten patients of both sexes of the Hospital Cândido Rondon (HCR) in Ji-Paraná, RO with a diagnosis of type II diabetes mellitus, and with age ranging between 40 and 65 years, underwent duodenal exclusion and truncal vagotomy, all performed by the same surgeon.

For inclusion criteria, the patients were required to have a body mass index (BMI) below 40 kg/m², C peptide levels greater than 1 ng/mL, and anti-GAD levels less than 1 U/ml, and agreed to sign an informed consent document after having all the risks and benefits offered by the surgery explained.

The patients also underwent an individual psychological evaluation in order to evaluate the individual's state of awareness and if he or she was suitably prepared for the surgery. The patient also underwent a battery of gastrointestinal, cardiac and pulmonary function evaluations in order to rule out any contraindications to a surgical procedure involving anesthesia. Any patient with a malignant disease would have been excluded, and this did not occur in the present study.

A follow-up protocol was developed with clinical and laboratory parameters. At each outpatient follow-up visit arterial blood pressure was measured and the BMI determined. Laboratory examinations included glucose, glycosylated hemoglobin, hemoglobin, hematocrit, LDL, HDL and total cholesterol, calcium, iron, albumin, globulin, total protein, and vitamin B12 in order to detect possible metabolic disorders and compare whatever changes appeared after the surgery.

The patients will be followed from the preoperative period until they complete one year postoperatively. In the postoperative period, the first outpatient visit occurred within one month after the surgery, the second visit after three months, and every 90 days thereafter until they had completed one year of follow-up. As the period of follow-up has not been completed, this report presents the preliminary results through 90 days post-surgery.

The surgical technique consisted of performing a truncal vagotomy with preservation of the stomach associated with complete section of the first portion of the duodenum with a linear stapler achieving the duodenal exclusion of the Roux-en-Y. The intestinal loop had a length of 2.5 meters starting from the cecum where it was sectioned with a second trigger of the linear stapler. Next, the intestinal course was reconstructed by pre-colic latero-lateral mechanical anastomosis between the jejunum and the greater curvature of the gastric antrum, next to pylorus. The segment that remains between where the first portion of the duodenum was sectioned up to where the jejunum was sectioned was manually anastomosed 80 cm from the ileo-cecal valve.

RESULTS

In the present study six patients were women, four were men. With the preoperative BMI ranging between 26 and 38 kg/m², none of the subjects was morbidly obese. Thus, patients were classified as overweight or Class I or Class II obesity.

The preoperative glucose was over 100mg/dl in all patients, even those using medication. No patient had a C peptide less than 1 ng/ml; the highest level was 3.8 ng/ml in one of the patients. No patient had an anti-GAD level above 1 U/ml. The glycosylated hemoglobin of the patients was between 6.4% and 11.5% (Table 1).

The time since diagnosis of type II diabetes mellitus (DM2) vary between 4 and 14 years. The majority of patients had comorbid conditions (Table 2).

The preoperative laboratory studies included lipid profiles: total cholesterol ranged between 142mg% and 262mg%, triglycerides between 119mg% and 310mg%, HDL between 32mg% and 54mg%, and LDL between 88mg% and 196mg%.

Table 1 - *Preoperative profile of the 10 patients: BMI, fasting glucose, C peptide, anti-GAD and glycosylated hemoglobin.*

Patient	IMC	Fasting Glucose	C peptide	Anti-GAD	GlycosylatedHemoglobin
1	26	322	3.1	0.1	11.5
2	27	242	1.85	0.72	8.7
3	31	110	3.8	0.6	11
4	38	162	3.03	1.0	7.3
5	35	121	1	0.6	7.5
6	35	289	3.17	1.0	10.8
7	38	169	2.7	0.1	7.8
8	31	153	1.6	0.6	6.4
9	28	157	1.3	0.8	8.8
10	38	167	2.37	0.5	8.3

Table 2 - *Morbidities associated with Type II Diabetes Mellitus in the patients who participated in this study.*

Morbidity	Number of Patients
Arterial Hypertension	5
Esophagitis	1
Dyslipidemia	3
Steatosis	2
Gastritis	1
Cholecystopathy	2
None	1

There were no complications during the operative period. All patients remained hospitalized after the procedure. Several required close observation in an intensive care unit. There were no postoperative complications; all patients were discharged by the third postoperative day.

Routine laboratory studies were obtained one month postoperatively and again three months after the surgery. During this period serum glucose levels were reduced in 100% of the patients (Table 3), and consequently there was also a reduction in glycosylated hemoglobin levels.

The reduction in body mass index (BMI) was between 2 kg/m² and 5 kg/m² during the first postoperative month and between 3 kg/m² and 7 kg/m² by the third postoperative month.

The lipid profile of these patients also changed over this period: total cholesterol declined to between 140mg% and 229mg%, triglycerides to between 109mg% and 267mg%, HDL to between 22mg% and 54mg%, and LDL to between 61.4mg% and 167mg%.

In general, levels of calcium, iron, albumin globulin, total protein and vitamin B12 remain within reference ranges considered normal.

DISCUSSION

Diabetes mellitus is the most common metabolic diseases, affecting close to 7.6% of the adult population between 30 and 69 years; it is estimated that in 2030 some 366 million people will have diabetes around the world. It constitutes a disease that has been responsible for the increase in mortality from cardiovascular diseases and microvascular complications, and as was seen earlier, DM2 affects the largest percentage of this population.[5,20,21]

This study had the objective of giving continuity to the previous descriptions about the efficacy of duodenal exclusion on DM2 in patients who are not morbidly obese; however, it is unprecedented when the proposal is the association of truncal vagotomy with duodenal exclusion. This study is part of a larger, master's thesis study, which is in development.

Bariatric surgeries definitively result in improvement or reversal of DM2, but it is noted in surgical practice that those techniques in which there is duodeno-jejunal exclusion, and those exclusively disabsorptive, are the most effective.[22]

DM2 can be associated with other comorbidities, for example dyslipidemia and arterial

Table 3 - *Comparison of the serum glucose profile of the 10 patients: preoperative, 30 days post-operative, and 90 days post-operative.*

Patient	Preoperative Glucose	Glucose 30 days Post-Operative	Glucose 90 days Post-Operative
1	322	130	80
2	242	105	102
3	110	80	80
4	162	127	82
5	121	140	114
6	289	186	78
7	169	105	80
8	153	130	120
9	157	133	117
10	167	127	110

hypertension. These two comorbidities were the most common among the participants of this study.[23]

In almost all of the subjects there was an important reduction in the serum glucose in the first postoperative month, and several became euglycemic. Only after the third postoperative month was glycemic control attained by all patients.

For COHEN[7], C peptide levels indicate whether the surgery can really cure DM2. The level of this substance determines whether a diabetic is still able to synthesize insulin. In this study, besides this, it was observed that the subjects that had the highest C peptide levels were those that best responded to treatment, and most rapidly achieved glycemic control. Several of these patients attained glycemic control within one month postoperatively.

It is postulated that diabetes control is a direct effect of duodenal exclusion.[24] In 2006, RUBINO[25] and cols. demonstrated in one of their studies that duodenal exclusion of the passage of nutrients is a critical component of the control of DM2.

As the group of patients that were part of this study were classified as overweight or Class I or Class II obesity, the truncal vagotomy was performed associated with duodenal exclusion in order to together promote the resolution of DM2, and also to promote weight loss in these patients.

Without exception, all the patients achieved significant weight reduction during this period. Just as occurs in vagal blockade, the weight loss was also expected with truncal vagotomy. The patients experienced early satiety and a reduction in the quantity of caloric intake.

Historically, surgical vagotomy was used as a treatment for ulcers. Over time it was noted that this technique caused anorexia and weight loss by mechanisms that are not clear, and with this observation, vagal blockade began to be performed as a treatment for obesity.[19]

The impact on levels of triglycerides and LDL and total cholesterol were also observed over the course of follow-up. Almost 90% of the patients had reduction in all of these measures.

It is known that elevated lipids and type II diabetes are two possible triggers of cardiovascular diseases, which represent the greatest cause of mortality. Various randomized placebo-controlled studies have demonstrated that a reduction in total and LDL cholesterol is associated with a lower incidence of cardiovascular events. Three of our patients had dyslipidemia. In these patients a reversal of the lipid profile would constitute a lowering of the risk of a cardiovascular event. Even if it did not constitute a risk for the majority of the patients in this study, it nevertheless constituted a method of prophylaxis.[26]

No patient developed nutritional disorders over the course of the study; however the risk of complications developing after the 90 day period of observation could not be excluded. Because with duodenal exclusion the stomach is preserved, the complications which are common with the Roux-em-

Y gastric bypass, such as anemia and vitamin B12 deficiency, are avoided.[9]

There was also improvement and reduction in blood pressure in our patients probably as a consequence of glycemic and lipid control, and the loss of body weight that occurred. The mechanisms responsible for this improvement are a reduction of hyperinsulinemia and of insulin resistance, a reduction of sympathetic activation as a result of the reduction in leptin levels, and reduction of intra-abdominal hypertension which frequently occurs in this class of patients.[11]

CONCLUSION

Duodenal exclusion associated with truncal vagotomy produced satisfactory preliminary results, since it acted in a positive way not only on the DM2, but also on excess body weight, on the lipid profile, and on blood pressure of the patients who participated in the study.

As these are only preliminary results, the data described in this study are not definitive, and may present changes in its efficacy over the course of time. This research will continue until the patients have completed one year of follow-up.

It has been shown, then, for now, that these surgical technique utilized in this study represents a safe mode of treatment of DM2 in patients who are not morbidly obese, but that present lesser degrees of obesity.

With the glycemic results obtained, one can also conclude that C peptide constitutes an important factor in the surgery in the fight against DM2. When this peptide is encountered in high levels, the patient has a greater chance of a better and more rapid response to the proposed treatment.

RESUMO

O diabetes melito tipo 2 (DM2) atinge grande parte da população obesa, podendo também ser diagnosticado em magros. Dentre os mecanismos que são propostos para a cura do diabetes destaca-se atualmente a cirurgia bariátrica. No meio cirúrgico, a exclusão duodenal tem sido foco de grandes estudos e tem demonstrado resultados satisfatórios tanto em doentes obesos quanto em magros. O objetivo do presente estudo foi avaliar a eficácia dessa técnica associada à vagotomia troncular, visando dessa forma ofertar junto à resolução do DM2 uma redução no peso corporal e melhora das complicações causadas por ambos. Essa técnica foi realizada em 10 doentes com DM2, de ambos os sexos, com idades entre 40 e 65 anos, e IMC menor de 39 kg/m². Os resultados preliminares de até três meses pós-cirurgia foram uma redução da glicemia, redução do peso corporal, melhora no perfil lipídico e da pressão arterial. Acredita-se que o componente crítico para redução da glicemia seja a exclusão duodenal da passagem de nutrientes. Assim como ocorre no bloqueio vagal, a perda de peso já era esperada também através da vagotomia troncular. Os doentes apresentaram saciedade precoce e redução no volume de ingestão calórica. Conclui-se com os resultados preliminares que a exclusão duodenal associada à vagotomia troncular demonstra ser uma técnica eficaz para tratamento de DM2, e que os níveis de peptídeo C determinam o seu sucesso, pois os doentes que apresentaram níveis mais elevados responderam melhor ao tratamento, no entanto se requer termino do presente estudo para uma conclusão definitiva.

Palavras-chave: *Diabete Melito tipo 2. Exclusão duodenal. Vagotomia troncular.*

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Original Article

Clipless Minilaparoscopic Cholecystectomy VS. Conventional Laparoscopy: A Comparative Study of the Hospital Charges for Minimally Invasive Treatments for Gall Bladder Diseases

Colecistectomia Minilaparoscópica VS. Laparoscópica: Um Estudo Comparativo de Custo Hospitalar entre Dois Tratamentos Minimamente Invasivos para Doenças da Vesícula Biliar

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ABSTRACT

Introduction: For the surgical treatment of gall bladder diseases, laparoscopic cholecystectomy has been accepted as the gold standard. The minimally invasive procedure is undeniably superior in various respects when compared with open surgery and this is also true on the aesthetic criteria when the conventional laparoscopic cholecystectomy (CLC) is compared with the mini-laparoscopic cholecystectomy (MLC). **Objective:** Evaluate the hospital charges associated with these procedures and specify the differences concerning these techniques. **Method:** Comparative and retrospective study of hospital charges, with 40 consecutive patients, who underwent laparoscopic cholecystectomy at a private institution in Recife, Brazil. There were two groups with 20 patients each. One group underwent conventional laparoscopic cholecystectomy and in the other the minimally invasive approach was performed. The surgeries were performed between July 2006 and December 2007 and some actual charges concerning individual differences were replaced with standardized charges for all patients. Only the hospital charges were considered in this study. The arithmetic mean was used to compare the total charges for the entire procedures. **Results:** The MLC procedures showed no significant difference in total hospital charges compared to the CLC approach. Charges totaled R$ 2470 (Brazilian Reais) in the minilaparoscopic technique; the total charges for the conventional laparoscopic surgery were around R$ 2550 (Brazilian Reais). **Conclusion:** The equivalence of hospital charges for the two procedures suggests that the mini-laparoscopic cholecystectomy (MLC) should be widely recognized among surgeons as offering better aesthetic results the conventional laparoscopic procedure. Studies comparing patient satisfaction with the surgical result, difference in post-operative morbidity, pain, and recuperation for the two procedures are needed.

Key words: Charges. Surgery. Laparoscopy. Needlescopic instruments.

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INTRODUCTION

Ever since the first laparoscopic procedure, the advantages and indications for this technique have increased systematically.[1] For the surgical treatment of diseases of the gallbladder, laparoscopic cholecystectomy has become the gold standard around the world. Now, mini-laparoscopic cholecystectomy – which is quite effective for removing the gall bladder – is growing rapidly in popularity among surgeons. Because it provides aesthetic results similar to those with NOTES (natural orifice transluminal endoscopic

surgery), it is being hailed as a new phase in videosurgery.[1,3]

The superiority of minimally invasive procedures when compared with open surgery in various aspects is undeniable, and this is also true between conventional laparoscopic cholecystectomy and mini laparoscopic cholecystectomy when you refer to aesthetic aspects.[2] Incision diameters that are significantly reduced, resulting in imperceptible scars would be reason enough to justify the mini-laparoscopic procedure, but in addition to this, there appears to be less postoperative pain, resulting in greater patient satisfaction. These facts support the need for greater dissemination and the indication of the mini-laparoscopic cholecystectomy for more patients.[4,5]

Still, changing paradigms or surgical techniques, involve overcoming historically enormous barriers and taboos; such changes are part of the evolution of surgical technique, of the innovation of procedures, and the technological advances in health. Moreover, the change in surgical technique proposed here, involves not only the greater dexterity on the part of the surgeon in handling the delicate equipment, but also the purchase of this expensive equipment, and time-consuming training. Unequivocally, underwriting the costs of this new technique, by either the patient or the hospital, is mandatory for the success and diffusion of the procedure.[6,7]

Given the dearth of studies comparing the costs of conventional laparoscopic cholecystectomy (CLC) and the mini-laparoscopic cholecystectomy (MLC), this study sought to evaluate the hospital charges associated with these procedures, and also specifies the difference in hospital charges of the surgical techniques, and the implications for the total cost of the procedure.

PATIENTS AND METHODS

This is a retrospective comparative study, of 40 consecutive patients, who underwent laparoscopic cholecystectomy at a private hospital in Recife. Twenty patients were operated by a single surgeon using the conventional laparoscopic cholecystectomy (CLC) technique, and 20 patients were operated by another surgeon using the mini-laparoscopic cholecystectomy (MLC) technique.

The surgeries were carried out between July 2006 and December 2007 and standardized in several aspects. All the patients were considered to have been hospitalized on a nursing ward, with use of the anesthesia recovery room for up to six hours and having utilized capnography, infusion pumps, and oxygen during the hospitalization. In addition, because the cases were accumulated over a period of 18 months, all charges were adjusted so that there were no price increases over time for the items charged.

Only hospital charges were considered, covering the period of the hospitalization, and were obtained from the hospital bill for each surgery. After all the bills were evaluated, adjustments were made to the charges in order to standardize them as described above, and a spreadsheet was developed in order to compare the charges of each step of procedures. In this way it was possible to arrive at an average total charge for the procedures in the two groups studied.

Operative Techniques

Conventional Laparoscopic Cholecystectomy

After standard positioning of the surgical team (Figura 1), the pneumoperitoneum was established by the closed technique with a Veres needle, using an umbilical incision, through which a 10 mm trocar was inserted, attaining an intra-abdominal pressure of 10 to 14 mmHg.

After the pneumoperitoneum was established a 30°/10mm optic was introduced through the umbilical trocar. Three more trocars were then inserted (Figura 2A): a 10 mm epigastric trocar was used to insert the electrocautery *hook*, aspirator, retrieval clamp and scissors (all these tools were 10 mm). Two more 5 mm trocars were inserted in the right subcostal region for the introduction of the retrieval clamps. The

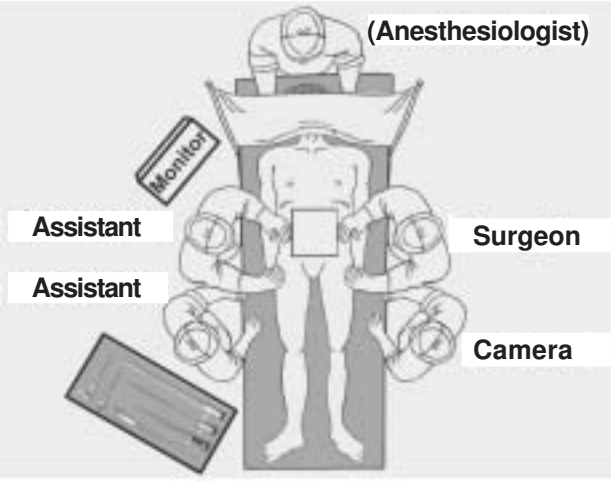

Figure 1 – *Positioning of the surgical equipment.*

placement of the trocars was standardized for all the patients (Figura 2A).

After the trocars were inserted, the abdominal cavity is evaluated before initiating the surgical procedure. Cases perceived to be of high complexity are at this point converted to open surgery. In the rest, after dissection of the cystic infundibulum, the cystic artery is identified and sectioned between endoclips, after which the cystic duct is isolated, ligated between endoclips, and sectioned. The dissection of the gallbladder as well as the hemostasis of the hepatic bed is performed with electrocautery. After the gall bladder is completely freed, hemostasis is confirmed and the abdominal cavity is cleaned. After transferring the optic to the epigastric portal, the gall bladder is removed through the umbilical trocar.

Mini-laparoscopic Cholecystectomy

After standard positioning of the surgical team (Figura 1), the pneumoperitoneum was established by the open technique, through umbilical incision, in which a 10 mm trocar was inserted, using intra-abdominal pressure of 8 to 12 mmHg.

After the pneumoperitoneum was established a 30°/10mm optic was introduced through the umbilical trocar. Given its high cost and limited durability, the 2/3 mm mini-laparoscopic optic was not used in a single case. Three more trocars were then inserted (Figura 2B): the 3 mm epigastric trocar was used for the insertion of the electrocautery (*hook*), aspirator, retrieval clamp and scissors (all these tools were 3mm). Two more 2 mm trocars were inserted in the right subcostal region for the introduction of the retrieval clamps. The placement of the trocars was standardized for all patients (Figura 2B).

After the trocars were inserted, the abdominal cavity is evaluated before initiating the surgical procedure. High complexity cases at this point were converted to conventional laparoscopy with 5 mm trocars. In the rest, after dissection of the cystic infundibulum, the cystic artery is identified and cauterized close to it, after which the cystic duct is isolated, ligated and sectioned between surgical knots of 2-0 braided polyester. The dissection of the gall bladder, as well as the hemostasis of the hepatic bed is done with the electrocautery "*hook*". After the gall bladder is completely freed, hemostasis is confirmed and the abdominal cavity is cleaned. A bag is improvised from the wrist of a sterile glove for the retrograde removal of the gall bladder, replacing the costly "endobag". The bag is introduced the site of the 10 mm umbilical trocar. The optic is reintroduced, the gall bladder is inserted in the bag and is guided by the most lateral clamp toward the optic trocar through which the removal is completed. None of the mini-laparoscopic procedures required the use of "clips", "endobags" or 2/3 mm mini-laparoscope optics.

RESULTS

Because the operating room, medications and room charges of the hospitalization were standardized, the difference in total charges between the two groups was due to charges for surgical material, which in this case involved principally surgical trocars, clips, and sutures.

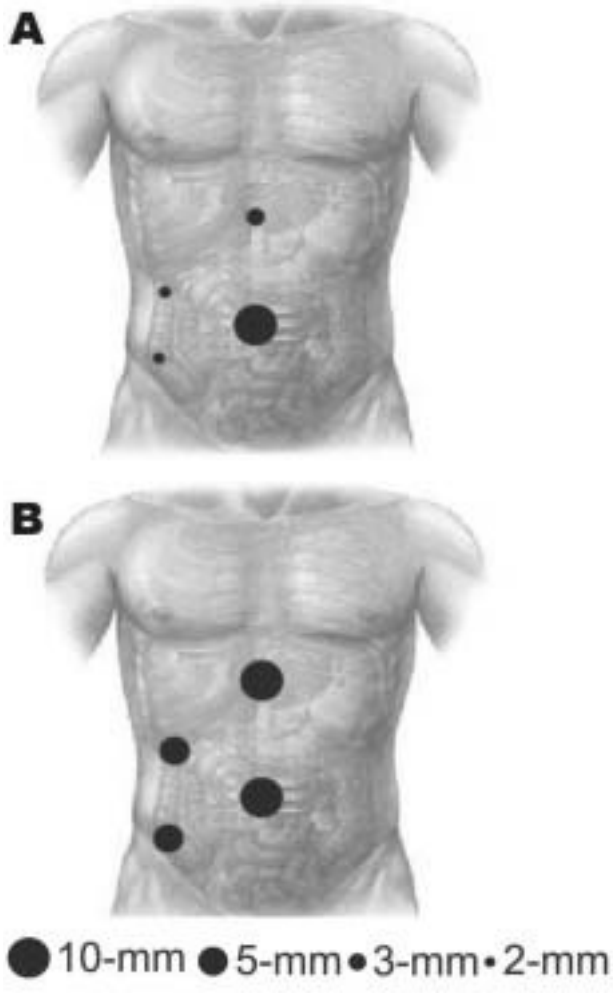

Figure 2 – *Trocars. A: Incisions of the Mini-laparoscopy (MLC); B: Incisions of the Conventional Laparoscopy (CLC).*

There was no statistically significant difference in the total hospital charges between the two procedures studied. For the MLC procedures there was a reduction of close to 3% of charges, when compared with the CLC procedures. While the average charge for the mini-laparoscopic cholecystectomy was R$ 2,470.00, the average charge for conventional laparoscopic cholecystectomy were R$ 2,550.00.

Table 1 presents in greater detail the average charges for all the billed procedures with a breakdown of the charges for medications used in the operating room or the nursing ward, surgical material, up to six hours of use of the recovery, daily room rates for a bed in a nursing ward, equipment used during the hospitalization (capnograph, continuous infusion pump, oxygen by the hour of use) and the use of the videosurgery suite for up to three hours.

DISCUSSION

The standardization of several parameters was considered necessary because of factors peculiar to each patient which could interfere in the total charges of each procedure. The procedures were in a private hospital offering a variety of accommodations ranging from multi-bed nursing wards to private rooms with a private duty attendant. So that hospital room charges which would not be affected by patient choices in their accommodation, a standard daily room charge was applied for all cases based on the charge for a nursing ward bed without an attendant.

Other items that vary depending on individual factors and that would affect the charges were grouped and were similarly standardized for all the surgeries. This was the approach used for continuous infusion pumps, capnographs and oxygen. All cases were considered to have used one infusion pump, a capnograph for up to 24 hours, and oxygen for up to one hour during the surgery, since none of the 40 procedures lasted longer than one hour. Others services used rarely, such as the anesthesia recovery room for more than six hours, and need for oxygen exceeding one hour, or other utilization such as emergency consultations, and laboratory tests not directly related to the surgical procedure were excluded from the calculation of individual patient's hospital charges.

Regarding the surgical techniques, besides the discrepancy in the diameter of the clamps, the cases differed in relation to the utilization of endoclips. While the conventional laparoscopic procedures studied used endoclips, the MLC used surgical sutures instead. Regarding the equipment used, those of a narrower diameter are more expensive and more delicate, but not more fragile, as the useful life of the equipment for the two groups was equal. Still, in the MLC the electrocautery hook had to be substituted every four procedures, resulting in an additional charge per surgery of approximately R$100.00.

It is worth noting that the non-use of endoclips in the conventional laparoscopic procedure is a variant of this technique and can reduce the costs of the procedure. Still, in the surgeries using the mini-

Table 1 – *Average hospital charges detailing the materials used in each of the two procedures.*

Description of the bill	**CLC (in R$)**	**MLC (in R$)**
Medications (operating room and nursing ward)	518.19	881.57
Surgical Material (trocars, clips, electrocautery)	1089.71	653.27
Trocars	272.00	272.00
Clips	132.64	-
Electrocautery	-	100.00
Veres needle	408.32	-
Surgical sutures	79.19	71.45
Charge for the videosurgery suite for up to three hours	610.00	610.00
Sum of the charge for the anesthesia recovery room for up to six hours, daily charge for a bed on the nursing ward, charge for the use of the capnograph for up to 24 hours, charge for the infusion pump, and charge for up to one hours of oxygen.	250.00	250.00
Average Total charges per surgery	**2547.31**	**2466.52**

laparoscopic technique, the average of total medication charges – including anesthesia (sedation) and post-operative drugs – was about 70% greater (R$ 880.00) than for the conventional laparoscopic technique (R$ 520.00). This difference can be explained by the use of different drugs for the induction of anesthesia and different post-operative standing medication orders that were not standardized among the surgeons, factors that reflect the experience of the surgeon with certain drugs and peculiarities of the patients undergoing the surgeries in the series.

If the charges associated with the procedure might constitute a barrier to the indication of the mini-laparoscopic cholecystectomy, this study finds equivalence in the hospital charges of the two techniques. Certainly, the cost de acquisition of the mini-laparoscopy equipment should be mentioned; those of smaller diameter utilized in the mini-laparoscopic procedure are a bit more costly when compared with those utilized in the conventional laparoscopic cholecystectomy.[8] But this study limited its analysis to hospital charges for the surgical procedure, after acquisition of the equipment. More studies comparing patient satisfaction with the procedures, parameterization of pain and return to normal activities are necessary for a more detailed analysis of the indications of these procedures.

CONCLUSIONS

Because it does not represent an increase in hospital charges when compared to the conventional laparoscopic procedure, the mini-laparoscopic cholecystectomy should be more widespread and more frequently indicated by surgeons. Besides the similarity in charges, the superior cosmetic benefits of mini-laparoscopic cholecystectomy – tiny orifices resulting in imperceptible scars whose aesthetic results are equivalent to N.O.T.E.S.[9,10] – should not be forgotten.

RESUMO

Introdução: Para o tratamento cirúrgico das doenças da vesícula, a colecistectomia laparoscópica tem sido o padrão-ouro. Inegável é a superioridade em diversos aspectos do procedimento minimamente invasivo quando comparado com a cirurgia aberta e isso se dá também no quesito estético entre a colecistectomia laparoscópica convencional (CLC) e a colecistectomia minilaparoscópica (CML). **Objetivo:** Avaliar os custos hospitalares envolvidos na CLC e CML. **Método:** Estudo retrospectivo, comparativo, com 40 pacientes consecutivos, submetidos à colecistectomia laparoscópica em hospital privado do Recife, sendo 20 pacientes operados por um único cirurgião pela técnica laparoscópica convencional (CLC) e 20 pacientes por outro cirurgião pela técnica minilaparoscópica (CML). As cirurgias foram realizadas entre julho de 2006 e dezembro de 2007 e foram padronizadas em diversos aspectos. Foram considerados apenas custos hospitalares, compreendendo o período da internação, de acordo com a fatura individual de cada cirurgia. Foram elaboradas planilhas comparativas de custo por etapas do procedimento de todas as cirurgias e chegou-se a um valor médio de custo por procedimento. **Resultados:** Não houve diferença estatisticamente significante nos custos hospitalares entre os dois procedimentos estudados. Enquanto o custo médio da CML é de R$ 2.470,00, os gastos com a CLC chega aos R$ 2.550,00. **Conclusão:** A equivalência nos custos hospitalares aponta para necessidade de maior difusão da técnica minilaparoscópica, pois essa possui resultados estéticos superiores ao procedimento laparoscópico convencional. São necessários estudos que avaliem a satisfação do paciente com o resultado cirúrgico, diferenças na morbidade pós-operatória como menor dor e recuperação pós-operatória entre ambas as técnicas.

Descritores: Cobranças hospitalares. Minilaparoscopia. Colecistectomia.

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Original Article

Laparoscopic Adrenalectomy: Review of Complications in 123 Procedures at a Single Brazilian Center

Adrenalectomia Laparoscópica: Revisão das Complicações em 123 Procedimentos de um Centro Brasileiro

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ABSTRACT

Introduction: The laparoscopic approach to the adrenal gland was first reported in 1992. Since then, many publications about this issue have come from Europe, Japan and North America. We reviewed our 13-year experience with laparoscopic adrenal surgery. **Patients and Methods:** Laparoscopic adrenalectomy was carried out in 132 patients between January 1994 and January 2007. The first 113 procedures, in 77 females and 36 males, were reviewed. Age ranged from 1 to 76 years (43.1 ± 16.2 years). Nineteen (16.8%) patients had unilateral tumor larger than 4 cm; 25 (22.1%) patients had a Body Mass Index ³ 30 kg/m2; and 13 (11.5%) had had previous open upper abdominal surgery. The size of the lesion ranged from 1 to 9 cm (3.3 ± 1.6 cm). A total of 123 adrenalectomies were performed in 116 operations, of which 109 were unilateral and 7 were bilateral. The lateral transperitoneal approach was employed in 113 cases; a lateral retroperitoneal approach was used in 3 adrenalectomies. All patients were followed for a minimum of 36 months. **Results:** Unilateral procedures took 107 33.7 min (45-250 min); bilateral procedures 180 ± 90.6 min (100-345 min); 5 (4.3%) cases were converted to open surgery. Twenty (17.7%) patients suffered complications, of which 8 (7.0%) were intra-operative and 12 (10.6%) postoperative complications. Six (5.3%) cases were considered major complications. No deaths occurred due to the surgical procedures. The blood transfusion rate was 3.5%. **Conclusion:** Laparoscopic adrenalectomy is feasible and has excellent results in selected patients.

Key words: Laparoscopy. Laparoscopic adrenalectomy. Adrenalectomy.

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INTRODUCTION

The laparoscopic approach to the adrenal gland was first reported in 1992.[1,2] Since then, nearly 1000 articles have been published (*Medline*, May 2007), encompassing thousands of patients. The efficacy and safety of laparoscopic adrenalectomy are well established.[3-7] Studies comparing open surgery and laparoscopic surgery have demonstrated that the laparoscopic intervention should be considered the gold standard for adrenal surgery.[8-13] The criteria for selecting patients, however, is important. The majority of patients who have undergone laparoscopic adrenalectomy since 1992 have involved cases of benign disease and tumors of up to 8 cm in their greatest dimension. Patients with tumors with evidence of local invasion and patients with more voluminous tumors are better treated with open surgery. The definition of what constitutes a large tumor depends on the personal experience of the surgeon, but the definition of local extension depends on imaging studies and is less subjective.

Most of the reports of laparoscopic surgery of the adrenal gland come from North America, Europe, and Japan. Few studies have come from Latin America.[14-16]

In this study, we present our experience with laparoscopic adrenalectomy, with emphasis on detailed

reporting of complications, comparing them with data already published in the international literature.

PATIENTS AND METHODS

Laparoscopic adrenalectomy was performed in 132 patients between January 1994 and March 2007. Of these, the first 113, including 77 women and 36 men (2.13:1), were evaluated as they had accumulated at least 36 months of postoperative follow-up. The results were evaluated retrospectively. Two exclusion criteria were applied at the time of the indication for surgery: extra-adrenal tumor invasion observed with computerized tomography (CT) and tumor size exceeding 9 cm in its largest axis. Age varied from 1 to 76 years (43.1 ± 16.2 years) and the BMI varied from 18.7 to 40.5 kg/m^2 (27.4 ± 4.5 kg/m^2). Ten (8.8%) patients were 20 years older or younger; 19 (16.8%) had unilateral tumors larger than 4 cm; 25 (22.1%) patients were considered obese (BMI ³30 kg/m^2); and 13 (11.5%) had previously undergone some surgical procedure in the upper abdomen.

Ninety-eight (86.7%) of the 113 patients presented unilateral solid tumors of the adrenal, 45 on the right side and 53 on the left side. Twelve (10.6%) patients presented bilateral tumors (5 cases) or Cushing's disease of the pituitary (7 cases). Three (2.6%) patients presented cystic tumors of the adrenal measuring 4 to 6 cm in the largest dimension.

The preoperative clinical diagnosis upon which the indications for surgery were based were as follows: nonfunctioning adenoma (33 patients), primary hyperaldosteronism (24 patients), Cushing's syndrome (21 patients), pheochromocytoma (16 patients), Cushing's disease of the pituitary (7 patients), virilizing tumor (4 patients), pseudocyst (3 patients), pheochromocytoma associated with a contralateral nonfunctioning tumor in the same patient (1 patient) and a uncertain diagnosis between functioning and nonfunctioning tumor (4 patients).

Clinical investigation was carried out by endocrinologists specialized in adrenal disorders with the goal of establishing the diagnosis which best explained the hormonal function of each case. The measurement of the greatest dimension of the adrenal lesion was obtained by means of CT and varied from 1 to 9 cm (3.3 ± 1.6 cm). One hundred and sixteen surgical interventions were performed in 113 patients. In 109 cases the intervention was unilateral; in seven cases it was bilateral. The total number of adrenal glands operated was 123. Of the 116 procedures, 113 were performed via a lateral transperitoneal laparoscopic technique and three via a lateral retroperitoneal technique. In three of 113 lateral transperitoneal interventions, a partial adrenalectomy was performed, all three in patients with bilateral disease and functioning tumors smaller than 3 cm, one with pheochromocytoma and two with hyperaldosteronism.

Statistical analysis: Initially all the variables were analyzed in a descriptive fashion. For the continuous variables, the analysis was based on the observation of minimum and maximum values, and in the calculation of means and standard deviations. For the classificatory variables, absolute and relative frequencies are calculated. The analysis of the hypothesis of equal proportions between groups was evaluated by means of the chi-square test and the Fisher exact test. The hypothesis of equality of means between two groups was verified using the Student "t" test. The level of significance for the test was set at 5%.

PREPARATION OF THE PATIENTS

The preoperative clinical preparation of patients with functioning tumors or Cushing's disease of the pituitary should be performed by the endocrinologists responsible for their respective patients. Basically, this means the correction of metabolic disturbances and control of arterial hypertension. All patients with a clinical or laboratory suspicion of pheochromocytoma should be prepared for surgery with prazosin, an alfa-blocker, with a dose ranging from one to 20 mg per day, during a period that varies from two to six weeks. All patients should undergo routine clinical and cardiologic examinations, and blood should be provisioned for the surgery.

Surgical preparation should follow these general guidelines, adjusted for each case: a light diet two days prior to surgery and a liquid diet on the eve of surgery; enema using 500 ml of glycerin solution to cleanse the sigmoid colon and the rectum; shaving of the abdomen immediately prior to surgery and antibiotic prophylaxis with a broad spectrum antibiotic administered in the operating room and usually maintained for 72 hours. The enema is not indispensible in all cases, but is important in those patients with chronic constipation. Prophylactic

anticoagulation may be appropriate in special cases, but not routinely.

In the operating room patients undergo general anesthesia with orotracheal intubation. Occasionally some patients may also undergo peridural blockade for postoperative analgesia, at the discretion of the anesthesiologist. Nasogastric drainage and a Foley catheter are placed in order to decompress the abdominal cavity. In all patients with a diagnosis of pheochromocytoma, in addition to a central venous catheter, peripheral arterial catheters are placed in order to constantly measure the mean arterial pressure. As in all laparoscopic procedures, partial pressures of oxygen and carbon dioxide are continuously monitored by oxi-capnography.

OPERATIVE TECHNIQUE [17]

Once anesthetized, patients are positioned on the surgical table in the following manner: for unilateral surgery, lateral decubitus at 45 degrees, elevating the side to be operated; for bilateral surgery, the same applies, one side at a time. Cushions, adhesive tape, and, in some cases, elastic stockings are placed in order to prevent bedsores, burns, nerve damage and venous thrombosis.

Once the routine steps of asepsis and antisepsis are performed, the following technical steps are obeyed:

1st) Insufflation of carbon dioxide (CO_2) into the peritoneal cavity by means of the introduction of the Veress needle into the abdomen, either in the midline, on the edge of the umbilicus, or in the midclavicular line on the same side of adrenalectomy to be performed. In cases of previous abdominal surgery, especially in the upper abdomen, the Veress needle is replaced by an 11 or 12 mm Hasson cannula, inserted by means of a minilaparotomy. In this first step of the procedure, the maximum intracavitary pressure attained varies between 15 and 18 mmHg.

2nd) With the pneumoperitoneum established, four trocars of 10/11mm are introduced into the abdomen. In children and in some thin patients two 10/11mm trocars and two 5mm trocars are used. A fifth 5 mm trocar is occasionally introduced in more difficult cases. With the pneumoperitoneum established, the insufflation pressure is adjusted to 12 to 15 mmHg on average, a bit more in obese patients and a bit less in children. For bilateral surgeries, the same protocol is carried out with the surgical team and the laparoscope stand switching sides, and the introduction of three or four additional trocars.

3rd) With the position of the patient on the surgical table and the equipment adjusted, and the abdominal cavity inspected and adhesions lysed, one proceeds with the medial mobilization of the colon and the exposure of the renal fascia and the great vessels, renal vein on the left side, and vena cava on the right side. Occasionally, only the mobilization of the hepatic flexure of the colon is sufficient in the cases where there is greater difficulty in exposing the vena cava. On the left side, the complete mobilization of the colon from the splenic flexure to sigmoid is always necessary.

4th) Right side: An adequate upward displacement of the liver almost always requires the partial sectioning of right triangular ligament. Next incising the posterior reflection of the peritoneum immediately below the liver, between the vena cava and the right triangular ligament, one identifies, generally by its characteristic yellow color, the adrenal gland. Proceed then to approach the medial aspect of the gland next to the inferior vena cava, through an incision on the right margin of the vein. Next identify the principal or central adrenal artery, a tributary of the inferior vena cava, which is sectioned between metal clips before manipulating the gland. From the ligature, approach the gland along the aspect that contacts the kidney, by incising Gerota's fascia or renal fascia and separating the adrenal gland from the upper pole of the kidney and from the renal vein. Finally, the superior and lateral borders are separated from adjacent structures, generally by delicate dissection, cauterization, and section of small arterial, veins and lymphatics. An approach medial to the adrenal favors the identification of the inferior vena cava and the adrenal gland, because the gland is pulled somewhat laterally.

5º) Left side: completely mobilize the left colon medially, from the splenic flexure to the upper narrowing of the pelvis. For the medial mobilization of the spleen and tail of the pancreas, the parietal peritoneum must be incised cranially along the left parietocolic groove up to the diaphragm. This maneuver is facilitated by rotating the surgical table to the right such that the patient is placed in a decubitus position of almost 90 degrees relative to the floor. The force of gravity moves the colon medially making it easier to displace the tail of the pancreas supero-medially. The plane of dissection between the tail of the pancreas and Gerota's fascia or renal fascia

is subtle and can be confused, creating a risk of injury to the pancreas. This is the most delicate moment of the left transperitoneal adrenalectomy. Proceed first, then, approaching the infero-medial aspect of the gland, identifying the upper edge of the renal vein, where one can isolate between clips and section the left adrenal vein. Then, free the gland lateral and superior aspect, taking care to cauterize the arterial vessels originating from the aorta, from the inferior phrenic artery, from the renal artery, all potential sources of bleeding. The left adrenal gland is in close approximation to the renal hilar vessels, which requires careful attention during inferior and lateral dissection. As in the approach to the right gland, the opening of Gerota's fascia between the kidney and the adrenal defines the proper dissection plane.

6th) Once completely freed, the surgical specimen is removed intact, without morcellation, from the abdomen, inside a plastic bag introduced endoscopically, by widening one of surgical openings of the abdominal wall, generally the most inferior, close to the antero-superior iliac crest.

7th) With the surgical specimen removed, proceed with the inspection of the abdominal cavity and the closing of the surgical wounds, in two planes, fascial and cutaneous, for incisions 10 mm or more, and by skin approximation only for incisions smaller than 10 mm.

Retroperitoneal Access

With the patient in lateral decubitus, exactly as is done in a classic lumbotomy, with the surgeon and assistant surgeon side by side, facing the dorsum of the patient, establish laparoscopic access to the retroperitoneum in the following manner:

1st) In the posterior axillary line, between the end of the last rib and the iliac crest, preferably in the inferior lumbar triangle (also known as Petit's triangle), where the musculature is thinner, open the skin 2 cm and after opening the wall by planes introduce the index finger into the retroperitoneum. With the index finger establish a space and free the peritoneum anteriorly. If the plane of dissection is correct you should be able to digitally identify the psoas muscle and the inferior pole of the kidney.

2nd) Having created the space digitally, introduce a Gaur balloon or an industrializado ball of silicone, so that is remains between the kidney and the psoas muscle. Inflate the balloon with about one liter of normal saline or air, maintaining it inflated for several minutes in order to promote hemostasis.

3rd) Deflate and remove the balloon from the retroperitoneum. Insert a 11 or 12 mm Hasson cannula, fixed to the aponeurosis, and insert a trocar in the bed created and maintained with CO_2 at a pressure of 15 to 18 mmHg.

4th) Under direct visualization three other trocars are introduced in the bed.

5th) The dissection partially obtained with the dilating balloon between the psoas muscle and Gerota's fascia or the renal fascia proceeds now agora with clamp and scissors, in order to expose the renal vessels, which are the principal anatomic landmark on both sides. On the right side the inferior vena cava is occasionally identified first.

6th) Cranial to the renal vessels, the adrenal gland is encountered; it is isolated from adjacent structures. Rarely can one proceed to ligation of the adrenal vein without first manipulating the gland. It is usually easier to partially dissect the gland and then identify the vein. Finally, complete the separation of the gland from the adjacent structures, in a manner similar to that already described for the transperitoneal approach.

7th) Section the adrenal vein between the metal clips and remove the bagged specimen through the incision made for Hasson's cannula.

8th) Close the surgical incisions.

Partial Adrenalectomy

The partial adrenalectomy obeys the following technical steps, besides those already described:

1º) Approach and dissection of the gland follows the steps described for transperitoneal or retroperitoneal access, except for the ligation of adrenal vein;

2º) Section the affected region, with a margin of safety, with a 35mm linear vascular stapler or by incision with ultrasonic bistoury.

3º) Confirm hemostasis of the bloody aspect of the gland, removal of the surgical specimen, and closure of the abdominal wall incisions.

CRITERIA FOR THE EVALUATION OF RESULTS

Patients were considered cured when their underlying diseases of the adrenal glands, metabolically active or not, could no longer be identified

by laboratory tests or imaging in the late post-operative period (>6 months).

Intra-operative complications were considered unexpected events in the surgical procedure, whether or not they required emergency measures or whether or not they requiring conversion. Conversion to open surgery itself was not considered an intra-operative complication.

Post-operative complications were considered any departure from the ideal evolution during the first three months after surgery, including the period in the hospitalization.

Major complications were those that contributed to morbidity and/or prolonged the period of convalescence and/or required a blood transfusion.

Patients were considered to have been transfused if they received a unit of packed red cells from the intra-operative period until discharge.

Surgical time was clocked from the beginning to the end of the insufflation of CO_2 in the transperitoneal procedures, this is, from the insertion of the Veress needle until the insufflator was turned off, generally leaving only the suturing of the skin of the four or five surgical incisions in order to complete the surgery. For the retroperitoneal procedures, surgical time was measured from the skin incision until the insufflator was turned off. For those patients who underwent additional procedures, only the time of the adrenalectomy was considered. In patients with previous abdominal surgeries, the time devoted to adhesiolysis was included in the operative time of the adrenalectomy.

Neither the intra-operative blood loss nor the quantity of analgesics administered were objectively evaluated. The time it took for patients to resume eating and ambulating were obtained from the nursing notes; the unit of measure was the day, not the hour.

RESULTS

One hundred and sixteen surgical interventions were carried out in 113 different patients because three patients with bilateral disease who were operated on two different occasions (two times) at the beginning of our series. In these 116 interventions, 123 glands were removed, 120 totally and 3 partially, with 66 (53.6%) on the right side and 57 (46.3%) on the left side. One hundred and twenty glands were approached through a transperitoneal route and three through a retroperitoneal route.

The unilateral procedures not converted took 107 ± 33.7 minutes (range: 45-250 min.); the bilateral cases 180 ± 90.6 minutes (range: 100-345 min.).

Five (4.3%) of 116 surgical interventions were converted to open surgery because of subperitoneal emphysema (1), intestinal adhesions (1), adherence of a pheochromocytoma to the posterior aspect of the inferior vena cava (1) and uncontrollable venous bleeding (2). (Table 1)

No death attributed to the surgery was observed during the 36 months that followed the surgeries. Nevertheless, two patients with lung cancer and adrenal metastases died because of disseminated disease.

Table 1 – *Conversions (and %) in Different Subgroups.*

Subgroup	No of interventions	Conversions (%)
All cases	116	5 (4.3)
Unilateral surgery	109	5 (4.6)
Right sided surgery	52	4 (7.7)
Left sided surgery	57	1 (1.7)
Bilateral surgery in the same operation	7	0
Non obese (BMI <30 kg/m^2)	88	3 (3.4)
Obese (BMI ³30 kg/m^2)	25	2 (8)
No history of upper abdomen surgery	110	4 (3.6)
Previous upper abdomen surgery	13	1 (7.7)
Tumor > 4 cm	19	1 (5.2)
Tumor ≤ 4 cm	97	4 (4.1)

There was no statistical difference among different subrgroups.

Twenty (17.7%) patients developed major and minor complications, of which eight (7.0%) were intra-operative and 12 (10.6%) post-operative. Of the twenty patients with complications, six (5.3%) had major complications: intra-operative hemorrhage with conversion and transfusion (2), acute tubular necrosis (2), retroperitoneal abscess (1) and pancreatic fistula (1).

Blood transfusions were necessary in four (3.5%) patients, two in the operating room and two post-operatively. The average post-operative length-of-stay was 5.7 ± 15.0 days (1-140 days). The duration of post-operative follow-up ranged from 36 to 120 months; cases were only included in this series if the patient had attained a minimum of 36 months of post-operative follow-up.

The final anatomo-clinical diagnoses in the 113 patients were as follows: non-functioning cortical adenoma (29), primary hyperaldosteronism (24, including 21 with unilateral adenoma, 1 with bilateral adenoma, 1 with bilateral micronodular hyperplasia, 1 with bilateral macronodular hyperplasia), Cushing's syndrome (20), pheochromocytoma (18), Cushing's disease of the pituitary (7), virilizing disease (4), metastases of lung cancer (3), adrenal pseudocyst (3), ganglioneuroma (2), myelolipoma (1), pheochromocytoma and hyperaldosteronism in the same gland (1), pheochromocytoma and contralateral non-functioning adenoma (1).

In six cases de primary unilateral adrenal tumor, the pathologist considered them malignant, four because of the high mitotic indices and two because of the presence of tumor thrombus in the corresponding central adrenal veins. In all six cases, the tumors were less than 5 cm in the major axis. Three were cases of virilization; two were cases of Cushing's syndrome, and one a non-functioning tumor. In none of these six cases has the supposedly malignant disease progressed. A minimum follow-up of 36 months is justified from an oncologic point of view when considering adrenal tumor disease, given the difficulty of anatomic pathologic interpretation.

Subjected to statistical analysis, the data revealed the following statistically significant differences ($p< 0.05$): unilateral adrenalectomy took longer during the first half of the series than during the second; in the first half of the series right-sided adrenalectomy took longer than left-side procedures (in the second half of the series the times equaled); the operative time was greater in the patients with tumors > 4cm in the longest dimension; the complication rate was greater in patients who underwent bilateral surgery; complications were more frequent in patients with Cushing's disease of the pituitary.

DESCRIPTION OF THE COMPLICATIONS

Intra-operative Complications

Complications occurred during surgery in eight (7%) of 113 patients. Two of these eight cases were converted to open surgery in order to repair a significant lesion of a vein. In the other cases complications were of a lesser importance and did not add morbidity to the patients.

In case 5 (the cases are numbered in chronologic order) at the moment that the surgical specimen – a tumor of 5.5 cm in diameter – was being removed the plastic bag, ill-suited for the procedure, tore and the specimen fell into the peritoneal cavity. To find the specimen, the trocar incision where the specimen would have been removed (originally about 4 cm in length), had to be widened to 7 cm in order to permit the surgeon's hand to be inserted. This maneuver added close to 50 minutes to the surgical procedure. The specimen was found and removed. Apart from the somewhat longer scar, the patient experienced no additional morbidity because of this accident.

In case 9, a 10 year old child with pheochromocytoma, a lesion of the adrenal vein that drains into the liver was torn during a maneuver to free the upper pole of the gland from the liver, required an urgent laparotomy. Beside the morbidity added by the laparotomy, the patient was transfused with five units of packed red blood cells. The hospitalization was prolonged with the patient discharged on POD 11. This case was considered a case with a major complication.

In case 26, a lesion of the epigastric vessels occurred during the insertion of a 10/11 mm trocar into the left iliac fossa. A Foley catheter was introduced, the balloon was inflated and traction applied throughout the procedure. At the end of the procedure the surgical incision was widened to remove the specimen and hemostasis was obtained without difficulty. The patient required the insertion of an extra trocar (5 rather than 4) and this was only alteration that the accident provoked.

In case 38, a man with a non-functioning tumor on the right side, metastasis of lung cancer, very adherent to the vena cava, the detachment of a large lumbar vein that drains into the vena cava occurred. Despite attempts to laparoscopically suture the vein, the bleeding could not be controlled and a median laparotomy had to be performed. The patient received five units of packed red blood cells in the operating room and the adrenalectomy was completed with difficulty due to the adherence of the tumor to the vena cava and the patient's obesity. The patient had no post-operative complications and was discharged on POD 3. This complication was considered a major complication, because of the morbidity added by the laparotomy and because of the transfusion.

In case 43, a non-functioning tumor of the right adrenal, several lacerations of the liver occurred, caused by the use of an improper retractor and because of the lack of experience of the surgical assistant. The lesions were cauterized without success and then tamponaded with gauze for several minutes. The bleeding stopped, the surgery was completed, and no complication occurred in the post-operative period. Blood loss evaluated by hematocrit and hemoglobin was considered insignificant and an ultrasound during the hospitalization did not reveal any abnormality.

In case 48, a right-sided pheochromocytoma, a small lesion of the anterior wall of the vena cava was produced at the beginning of the surgery while probing for a plane of dissection between the vena cava and the duodenum. The lesion was rapidly sutured and the surgery proceeded via laparoscopy without difficulty until its conclusion. Blood loss was insignificant and the patient evolved without other complications.

In case 80, an obese patient with Cushing's Disease, with various clinical complications, who was anti-coagulated (heparinized) because of a recent lower extremity deep vein trombosis, experienced bleeding during right adrenalectomy because of a superficial lesion of the liver. Using cauterization with an electric bistoury and tamponade with gauze, the bleeding stopped and the surgery was completed. There was no post-operative complication stemming from the accident.

In case 85, during a retroperitoneal dissection to treat a lesion of the right adrenal, a perforation of peritoneum occurred, which hampered but did not impede the completion of the procedure. No complication occurred as a consequence of the peritoneal lesion.

It was noted that in six (75%) of the eight intra-operative events, surgical access to the adrenal was from the right.

The BMI of patients who presented intra-operative complications ranged from 21.5 to 30.5 (mean: 26.6).

The greatest diameter of the glands that had nodules (there were two normal glands) ranged from 1.5 to 5.5 cm (mean: 3.6 cm).

Post-Operative Complications

Post-operative complications occurred in 12 (10.6%) of the 113 patients.

Case 8, a man with hyperaldosteronism due to a left adrenal tumor, on POD 1 presented a retroperitoneal hematoma that infiltrated the anterior abdominal wall and the scrotum. The hematoma was managed clinically; the patient developed acute renal insufficiency (ARI) and required transfusion with two units of packed red blood cells and several sessions of hemodialysis. He was discharged on POD 16 and has subsequently presented two other late complications: umbilical hernia at the site of one of the 10/11mm trocars and chronic hepatitis C, probably acquired in the hospital from the transfusion or hemodialysis. This case was considered a case with a major complication.

Case 10, an obese woman with Cushing's syndrome due to a left adrenal tumor, developed an abscess of the adrenal bed that twice required open drainage, prolonged parenteral nutrition and an extremely long hospitalization (140 days). Although not confirmed, the presence of a small pancreatic fistula must have been the cause of the complication. The patient evolved without late sequela and was cured of the hormonal disturbance. It is worth noting that the complication occurred in an open surgery after early conversion from a laparoscopic surgery when the patient was found to have a very distended colon that impeded continuation of the procedure. A left subcostal incision was made, and the surgeons proceeded with an open surgery that was uneventful. This case was considered a case with a major complication.

Case 15, a woman with hyperaldosteronism, developed a fever on the POD 1, apparently caused by pulmonary atelectasis. Com respiratory physical therapy and antibiotics, she improved and was

discharged with fever on POD 2. There were no other post-operative complications.

Case 17, a man with Cushing's Disease, was operated in two steps, at the beginning of the case series. The first surgery was a right adrenalectomy with complications. The second surgery, on the left side, was complicated by fever beginning on POD 4. An abscess of the adrenal bed was thoroughly drained via an open procedure. A low output pancreatic fistula was documented. The patient received parenteral nutrition and was discharged cured on POD 60. This case was considered a case with a major complication.

Case 23, a woman with a left sided "incidentaloma", presented with severe left shoulder pain of one week's duration that was attributed to diaphragmatic irritation or poor positioning of the patient on the operating table. Abdominal ultrasound and radiographs of the shoulder were normal on POD 3. With parenteral analgesia she improved and was discharged on POD 10 with pain. She did not present other complications.

Case 36, uneventful surgery of a non-functioning tumor of the left adrenal, developed marked distention of the small intestine on POD 1. The patient experienced no vomiting and was discharged on POD 4 with mild residual distention, but eating normally. There were no further post-operative complications.

Case 40, a woman with Cushing's Disease who underwent bilateral adrenalectomy and implanting of part of one adrenal gland in the subcutaneous tissue of the forearm, developed fever on POD 1. With broad-spectrum antibiotics – chosen in light of her immunocompromised state – the fever resolved and she was discharged on POD 6. She did not present any late complications.

Case 50, a woman with Cushing's Disease who underwent bilateral adrenalectomy and implanting of part of one adrenal gland in the subcutaneous tissue under the incision made for a trocar in the abdomen, developed fever on POD 1 and signs of inflammation at the implant site. With antibiotics she improved slowly and was discharged on POD 16. She did not present any other late complications.

Case 51, a patient with severe hypertension caused by a right-sided pheochromocytoma measuring 5 cm in its large dimension when evaluated by CT, was found intra-operatively to have a larger tumor, measuring nearly 6.5 cm, partially localized behind and adherent to the vena cava. The surgery was converted. During the operation, after ligation of the adrenal vein, the patient became hypotensive and developed oliguria and ARI and treated with diuretics and diet. The patient improved and was discharged on POD 5. On POD 12 the patient noted spontaneous drainage of a subcutaneous purulent collection in the wide subcostal incision. The patient improved and presented no further late complications. This case was considered a case with a major complication.

Case 53, a woman with Cushing's syndrome caused by a 3 cm tumor of the left adrenal, had an uneventful surgery, but developed abdominal distention and uncontrollable vomiting. She was managed clinically and was discharged on POD 15. It was later determined that she had chronic calculous cholecystitis, an established diagnosis, but which was overlooked. She progressed well and presented no further complications. She was referred for cholecystectomy.

Case 61, a patient with Cushing's syndrome for bilateral macronodular hyperplasia of the adrenals, underwent bilateral adrenalectomy, and was discharged on POD 6. One month later she presented to the Emergency Room with diffuse abdominal pain and vomiting. An ultrasound, confirmed by CT, showed a small hematoma in the left adrenal bed, apparently unrelated to the clinical presentation. She was treated with a brief fast and analgesics and fully recuperated. She presented no further late complications.

Case 62, a man with a right-sided pheochromocytoma, was operated uneventfully, but developed abdominal distension on POD 1, perhaps because his diet was advanced prematurely. He was discharged on POD 2 without other complications.

The BMI of patients who presented post-operative complications ranged from 21.1 to 36.9 (mean: 27.1).

The largest diameter of the adrenal that contained nodules – four glands found to be normal – varied from one to five centimeters (mean: 2.4 cm).

In an earlier publication, we analyzed our first 94 patients, and presented the complications in different subgroups derived from that cohort[15] (Table 2).

DISCUSSION

Minor and major complications occurred in 20 (17.7%) patients. There were six (5.3%) major complications that added morbidity or provoked a prolonged hospitalization. Two of these six major complications occurred as consequences of open surgery; these two patients (cases 10 and 51) were

Table 2 - *Complications: intra-operative, post-operative, total, and major in different subgroups of the study.*

Subgroup	No. of patients	Intra-operative Complications (%)	Post-operative Complications (%)	Total Complications (%)	Major Complications (%)
All cases	94	8 (8.5)	12 (12.8)	20 (21.3)	6 (6.4)
Unilateral surgery (85) or bilateral surgery in two steps (3)	88	7 (8)	9 (10.2)	16 (18.2)	6 (6.8)
Unilateral surgery (right)	42	5 (11.9)	3 (7.1)	8 (19)	3 (7.1)
Unilateral surgery (left)	49	2 (4.1)	6 (12.2)	6 (12.2)	3 (6.1)
Bilateral surgery in a single operation	6	1 (16.7)	3 (50)	4 (66.7)	0
Nonfunctioning Tumor	25	2 (8)	2 (8)	4 (16)	0
Hyperaldosteronism	21	1 (4.8)	2 (9.5)	3 (14.3)	1 (4.8)
Cushing Syndrome	17	0	3 (17.6)	3 (17.6)	1 (5.9)
Pheochromocytoma	13	3 (23.1)	2 (15.4)	5 (38.5)	2 (15.4)
Cushing Disease	7	1 (14.3)	3 (42.9)	4 (57.1)	1 (14.3)
Virilizing Tumors	4	0	0	0	0
Metastases	3	1 (33.3)	0	1 (33.3)	1 (33.3)
Pheochromocytoma & hyperaldosteronism	1	0	0	0	0
Pheochromocytoma and incidentaloma	1	0	0	0	0
Ganglioneuroma	1	0	0	0	0
Myelolipoma	1	0	0	0	0
Men	33	4 (12.1)	5 (15.1)	9 (27.3)	5 (15.1)
Women	61	4 (6.6)	7 (11.5)	11 (18)	1 (1.6)
Obese (IMC $\geq$ 30)	22	1 (4.5)	2 (9.1)	3 (13.6)	1 (4.5)
Non-obese (IMC < 30)	72	7 (9.7)	10 (13.9)	17 (23.6)	5 (6.9)
Nodule >4cm	10	1 (10)	1 (10)	2 (20)	1 (10)
Nodule <= 4cm	84	7 (8.3)	11 (13.1)	18 (21.4)	5 (5.9)
Converted	5	2 (40)	2 (40)	4 (80)	4 (80)
Previous abdominal surgery	10	1 (10)	2 (20)	3 (30)	1 (10)

Among the various subgroups there were only statistical differences in the subgroup that underwent bilateral surgery in a single operation versus those who underwent unilateral surgery or bilateral surgery in two steps (p=0.02); and in male and female subgroups, but only in relation to the subgroup with major complications. (p = 0.02).

In the subgroup of anatomic and clinical diagnoses there were no differences among the different subgroups. However, if Cushing Disease versus the sum of the other is analyzed, there is a significant difference in the complication rates (p=0.04).

electively converted as the laparoscopy was getting underway. Thus there were actually four (3.6%) major complications. This rate is similar to that reported by authors with similar case series.

The comparative statistical analysis found just three differences: 1) among men and women with respect to the incidence of major complications; 2) between unilateral surgery and bilateral surgery in the same operation; and between Cushing's disease of the pituitary and other anatomic and clinical entities. There were no differences between left and right sided procedures, nor between tumors smaller and larger than 4 cm, obese and non-obese patients, and patients with a history of prior abdominal surgery.

Tsuru *et al*.[47] demonstrated that there is no statistically significant difference with regard to operating time, hemorrhage, the length of hospitalization, as well as the rate of complications in individuals with tumors greater than 5 cm, when compared to individuals with tumors smaller than 5 cm.

The complications in cases of bilateral disease operated in the same laparoscopic procedure and those with Cushing's Disease of the pituitary were actually the same cases. *Cushingoid* patients are extremely ill, especially those with long-standing and advanced disease. All of our cases of Cushing's disease of the pituitary had already undergone one or two surgeries of the pituitary without success and presented various clinical complications. In truth, these patients are quite ill and complications with either laparoscopic surgery or open surgery are expected.[18,19] Other authors have reported extremely high complication rates, close to 50%, in comparable patients.[20] Thus the nature of this disease, rather than the laparoscopic technique, is likely responsible for this situation.

Pheochromocytoma cases were not statistically different from other subgroups, but the characteristics of the sample and the relatively small number of cases of pheochromocytoma, do not permit a conclusive analysis. Other authors have demonstrated that pheochromocytoma cases are not different from others, except Cushing's Disease cases. Many reports in the literature in recent years has suggested that pheochromocytoma should be operated primarily by the laparoscope, even when bilateral or associated with a paraganglioma.[21-31] Our experience with pheochromocytoma points in the same direction.[32]

In an article published by Zhang *et al.*,[50] the authors concluded that even in experienced hands, adrenalectomy in patients with pheochromocytoma resulted in a 37.7% rate of severe hypertensive crises, which in turn increase the risks and complication rates of this procedure.

Bilateral surgery, when indicated, should, according to various authors, be performed as a single operation, which is safer for the patient.[8, 33-36]

Porpiglia *et al.*[49] observed that all of the cases of adrenocortical carcinoma studied in their series were larger than 4 cm in diameter and had heterogeneous areas on radiologic examination. In addition, a serious complication in this study was the seeding of tumor cells in the trocar incision, which became evident five months after the surgical procedure**.**

The results of several authors are presented in table 3.

Table 3 - *Laparoscopic adrenalectomy results reported by various authors.*

Author	No. of patients	Age in years	Female/ male ratio	Nodule Size (cm)	Unilateral time (min.)	Conversions (%)	Total Complications (%)	Death (%)	Transfusion (%)	Hospital stay (days)
Thompson et. al.[37]	57	50	1.5:1	2.9	167	12	6	0	3.5	3.1
Mancini et al.[38]*	172	52	1:1.5	4.9	132	7	8.7	1.16	NR	5.8
Gagner et al.[39]	88	46	2:1	1-14	123	3	12	0	NR	3
Filipponi et al.[7]	50	49.6	1.95:1	4.8	110	0	0	0	0	2.5
Imai et al.[13]	41	47.3	1:1	2.8	147	2.4	4.9	NR	2.4	12
Takeda et al.[40]	76	NR	1.45:1	3	203	3.9	NR	0	NR	NR
Terachi et al.[41] *	370	NR	NR	NR	NR	3.5	15	0	NR	NR
Michel et al.[42]	63	41	2:1	4	120	3	6.3	0	1.6	4
Suzuki et al.[43]	75	51.9	1:1.1	NR	202	6.7	28	0	9.3	NR
Bendinelli et al.[9]	61	NR	1.7:1	NR	96.5	1.6	6.5	0	0	3.4
Henry et al.[44]	159	49.7	1.6:1	3.2	129	5	7.5	0	0.6	5.4
Bonjer et al.[45]	95	50	2.1:1	3.4	114	4.5	11	0.9	NR	2.2
Walz et al.[46]	560	52.4	1.6:1	2.9	67	1.7	15.7	0	1.3	2.8
Tsuru et al.[47]	178	47.9	NR	6.5	176	0	12	0	2.3	5.0
Meria et al.[49]	212	48	1.3:1.0	1.73	102	14	10	0	2.8	3.6
Porpiglia et al.[49]	205	63.8	1:1	5.9	164	0.5	0	0	NR	4.9
Zhang et al.[5o]	56	36.1	1:1.3	4.6	50.4	1.0	NR	0	0	5.2
Esta série	113	43.1	2.13:1	3.3	107	4.3	17.7	0	3.5	5.7

NR – not reported.
** Compilation of multiple services.*

CONCLUSIONS

From a significant personal experience of more than 130 cases operated over the course of more than a decade, combined with an enormous international experience, represented by more than a thousand published articles, it is possible to conclude the following:

1) Laparoscopic adrenalectomy is a well-established technique, which today represents the gold standard for adrenalectomy for most of the cases in which his surgery is indicated, whether total, bilateral, partial, in children and adults, those obese, and the elderly;

2) Large volume tumors, in general those greater than 9 cm in diameter, as well as those tumors with a radiographic appearance suggestive of malignancy or invasion of adjacent structures, should in principle, be operated by open surgery;

3) Approximately 5% or less of all cases of laparoscopic adrenalectomy will be converted to open surgery for various reasons. Conversion represents only a change in strategy and is not a complication;

4) About 4% of patients may present major complications and close to 10%, minor complications, either because of the grave nature of their underlying disease, especially Cushing's disease, or because of the inherent complications experienced in surgical procedures on the adrenal;

5) When there is an indication for bilateral adrenalectomy, whenever possible both adrenals should be addressed in any single operation, because of the better results obtained when compared to surgery performed in two separate procedures;

6) Complications can be prevented, up to a certain point, when there is a good indication for laparoscopic adrenalectomy, adequate preoperative preparation of the patient, meticulous laparoscopic surgical technique, and conversion to open surgery without hesitation whenever necessary.

RESUMO

Introdução: *A abordagem laparoscópica da adrenal foi inicialmente relatada em 1992. A eficácia e a segurança da adrenalectomia laparoscópica já foram claramente estabelecidas. Neste trabalho, apresentamos nossa experiência com a adrenalectomia laparoscópica, com ênfase no relato detalhado das complicações, comparando-as com os dados já publicados na literatura internacional.* ***Pacientes e Métodos:*** *Entre Janeiro de 1994 e Janeiro de 2007, 132 pacientes foram submetidos a adrenalectomia laparoscópica. Destes, os 113 primeiros pacientes, dos quais 77 mulheres e 36 homens, foram avaliados. A idade variou de 1 a 76 anos (43,1 ± 16,2 anos). Dezenove (16,8%) tinham tumor unilateral maior do que 4 cm, 25 (22,1%) pacientes foram considerados obesos (IMC ³30 kg/m²) e 13 (11,5%) haviam sido submetidos previamente a procedimento cirúrgico no andar superior do abdome. Cento e dezesseis intervenções cirúrgicas foram realizadas em 113 diferentes pacientes porque 3 pacientes com doença bilateral foram operados em dois tempos. Nestas 116 intervenções, 123 glândulas foram removidas, 120 abordadas pela via transperitoneal e 3 pela via retroperitoneal.* ***Resultados:*** *Os procedimentos unilaterais não-convertidos demoraram 107 ± 33,7 min. (45-250 min.). Cinco (4,3%) casos foram convertidas para cirurgia aberta. Nenhum óbito decorrente da cirurgia foi observado. Vinte (17,7%) pacientes desenvolveram complicações, das quais 6 (5,3%) foram consideradas complicações maiores. Transfusão sangüínea foi necessária em 4 (3,5%) pacientes. O período de seguimento mínimo foi de 36 meses.* ***Conclusões:*** *A adrenalectomia laparoscópica é uma técnica muito bem estabelecida, que representa hoje o padrão-ouro da adrenalectomia para a maioria dos casos que têm indicação de cirurgia.*

Descritores: *Laparoscopia. Adrenalectomia laparoscópica. Adrenalectomia.*

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X Congresso Brasileiro de Videocirurgia SOBRACIL

25-28 Agosto 2010
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Convidados internacionais já confirmados

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Paul Curcillo (USA)
Eduardo Parra D'Avila (USA)
Michael Kia (USA)
Daniel Herron (USA)
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Steven Schwaitzberg (USA)
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UROLOGIA	10
CIRURGIA TORÁCICA	10

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