



Optimization of the Surgical Strategy for the Treatment of Inguinal Hernias

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ABSTRACT

Purpose: The purpose of this study is to evaluate how the surgical strategies in inguinal hernia repair have evolved during last decade, in concordance with the latest guidelines.

Patients and Methods: The study was conducted in two general surgical departments: one in an University Clinic in Romania and the second one in a County Hospital in Germany. The study was partially a retrospective and partially a prospective and was conducted between 2003 and 2015 and included 1550 patients.

Results: In this study we compared the surgical techniques used in both surgical departments. In the western European countries the standard surgical treatment for inguinal hernia is the mesh repair in over 75%, whereas in the eastern countries the percentage of mesh repair is less than 20%.

Conclusions: The treatment of inguinal hernia should be individualised for each patient and according to every surgeon preference.

KEYWORDS

Inguinal hernia repair, mesh repair, laparoscopic inguinal hernia repair, alloplastic techniques, Lichtenstein technique.

Introduction

Inguinal hernias represent one of the most frequent pathologies in general surgery, with implications on the population's state of health. It is estimated that approximately 20 million hernia repair surgeries are performed worldwide each year [1]. A high morbidity rate, complications with different degrees of invalidity, and the presence of relapses ensure that abdominal wall defects remain a topical issue in scientific research [2]. The incidence of inguinal hernia is estimated to be between 11/10000 in the case of the population aged 16 to 24, and 200/10000 in the case of the population aged over 75 [3]. Over the course of time, numerous conventional open surgical procedures have come into existence for repairing parietal defects and especially inguinal area defects; however, relapses could not be avoided completely [4]. Following the introduction of video-endoscopic techniques, the results were greatly improved and the frequency of relapses decreased [5]. The debate open vs. laparoscopic is still open, but the eventual benefit of video-endoscopy is clearly not the risk of recurrence (most authors agree on that point). Of all the video-endoscopic techniques, the ones most widely-used nowadays are the TEP (totally extraperitoneal) and the TAPP (transabdominal preperitoneal) techniques.

Patients and methods

The aim of the present study was to assess the effectiveness of the various surgical techniques used in the treatment of inguinal hernia. The study has two main components: in the first part, a retrospective study was conducted, stretching over a 6-year period, from 2003 to 2008. The study was a comparative one between two surgical centres: The Second Surgical Department of the Medical University of Cluj-Napoca, Romania, on the one hand, and St. Anna Stiftung Hospital of Lönigen, Germany. We decided to choose those hospitals for several reasons: first of all they have similar number of beds and second the number of senior surgeons who perform laparoscopic surgery are the same, respectively 10. The number of operations done every year in both departments are about the same, ranging between 2500 and 3000. In this first stage, the surgical techniques used in the two surgical centres

were compared. In the second part of the study were assessed the results obtained following the routine introduction of alloplastic and video-endoscopic techniques in the Second Surgical Department of Cluj-Napoca. The criteria for inclusion in the study, in the case of both groups, were: patients diagnosed with uncomplicated, primary inguinal hernia, patients with relapsed inguinal hernia, and patients with incarcerated but reducible inguinal hernia. The exclusion criteria were: patients with complicated inguinal hernia, patients with irreducible inguinal-scrotal hernia, and patients with severe associated conditions (cardiopulmonary conditions, neoplasia or decompensated hepatic cirrhosis). All data were collected from the individual patient files and from the registry books of the operating room. Postoperatively and during the follow up period the patients were asked to fill a pain evaluation form, regarding the intensity and duration of the postoperative pain. The study is a descriptive one.

Results

In the first part of the study were compared the results obtained in the two surgical centres. The two groups of patients were relatively homogeneous: 516 patients in the University Clinic (Group A), and 483 cases in the German Hospital (Group B), respectively. It was taken into consideration all consecutive patients operated with hernia. Annually, the distribution of cases was relatively uniform in the two groups, as described in Table 1.

Table 1: Annual distribution of inguinal hernia cases

	2003	2004	2005	2006	2007	2008	2009
Group A	81	80	83	87	94	91	516
Group B	72	73	84	82	85	87	483
Total	153	153	167	169	179	178	999

The analysis of the men-women ratio indicated a significantly higher frequency in the case of men, the ratio being 17:1 for group A and 15:1 for group B, as it is known that groin hernia is more frequent in man.

The hernia diagnosis is relatively easy to establish. It is based on the anamnesis and clinical examination, and in voluminous inguinal hernia cases, the patient also undergoes complementary imaging examinations (ultrasound scan, cystoscopy, CT scan).

A significant number of the patients with hernia were diagnosed with relapse. This may be the result of certain poor primary surgical techniques, but it can also be the consequence of certain medical conditions associated with the patient, as shown in Table 2.

Table 2: Hernia aetiology

	Group A		Group B		Total	
	No.	%	No.	%	No.	%
Primary	450	87.3	440	91.1	890	89.1
Secondary	66	12.7	43	8.9	109	10.9

In order to assess inguinal hernia as accurately as possible, we have used the Schumpelick classification [6]. According to the dimensions of the deep inguinal orifice, we have divided the patients into three stages as described in Table 3.

Table 3: Classification of inguinal hernia according to the diameter of the deep inguinal orifice

Stage	diameter	Group A		Group B		Total	
		No.	%	No.	%	No.	%
Stage I	< 1.5 cm	101	19.6	121	25.1	222	22.2
Stage II	1.5cm - 3 cm	328	63.6	295	61.1	623	62.4
Stage III	>3cm	87	16.8	67	13.8	154	15.4

The operative risk was appreciated by using the ASA (American Society of Anesthesiologists) classification.

The anaesthesia indication was carried out together with the anaesthetist. Group A patients received more often spinal anaesthesia (N=272, 52%) whereas in Group B it was preferred the general anaesthesia (N=405, 83,9%).

The operative techniques that were employed were the tissular and the alloplastic techniques. In this first stage of our study, tissular procedures prevailed in Group A, while alloplastic procedures were predominant in Group B (Table 4).

Table 4: The operative techniques used

Operative technique	Group A		Group B		Total	
	No.	%	No.	%	No.	%
Tissular	429	83.9	120	24.8	549	55
Alloplastic	87	16.8	363	75.2	450	45

The surgical approach was, in most cases, of the open type, in 91.3% of the cases in Group A, while in Group B, it was the video-endoscopic method that prevailed in 60.2 % of the cases (as compared to only 8.7% in Group A) (Table 5).

Table 5: Surgical approach method

Technique	Group A		Group B		Total	
	No.	%	No.	%	No.	%
Open	471	91.3	192	39.2	663	66.4
Video-endoscopic	45	8.7	291	60.2	336	33.6

In group A the most frequently performed techniques were open and did include only few cases that uses the a mesh, while in group B video-endoscopic alloplastic techniques were more frequent (detailed description of techniques in Table 6).

Table 6: Operative techniques

Operative technique	Group A		Group B		Total	
	No.	%	No.	%	No.	%
Bassini	116	22.5	18	3.7	134	13.4
Shouldice	-	-	102	21.1	102	10.2
Kirschner	175	33.9	-	-	175	17.5

Mc Vay	138	26.7	-	-	138	13.8
Lichtenstein	42	8.1	65	13.5	107	10.6
Stoppa	-	-	7	1.4	7	0.7
TEP	28	5.5	263	54.5	291	29.1
TAPP	17	3.3	28	5.8	45	4.5

The patients who had been operated on were observed throughout the entire study period, which made it possible to conduct an analysis of the recurrence frequency according to the type of primary intervention (Table 7).

Table 7: Postoperative recurrence

Type of intervention	Group A (%)	Group B (%)	Total (No.)
Bassini	11.2	12.7	119
Shouldice	-	0.9	9
Kirschner	10.5	-	105
Mc Vay	9.4	-	94
Lichtenstein	2.5	1.1	23
TEP	3.6	3.9	37
TAPP	3.5	3.2	33

One of the item evaluated was the postoperative chronic pain. Applying pain evaluation form to the patients we concluded that after open tissular techniques chronic pain and sensitive local disorders were in higher proportion as in the laparoscopic technique, as shown in Table 8.

Table 8: incidence of chronic postoperative pain and local sensitive disorders

Operative technique	Chronic pain		Sensitive disorders	
	Nr.	%	Nr.	%
Tissular	25	13,9	48	26,7
TEP	13	7,0	20	10,8

The intensity of postoperative pain was appreciated by the patients to be light and moderate. Only one patients from the open tissular technique group described pain as high intensity. In the laparoscopic group pain was light and had a duration of 6 to 12 hours (Table 9).

Table 9: Intensity of postoperative pain

Operative technique	Light pain		Moderate pain		Heavy pain		TOTAL	
	Nr.	%	Nr.	%	Nr.	%	Nr.	%
	Tissular	16	8,9	8	4,4	1	0,6	25
Laparoscopic	9	4,9	4	2,2	-	-	13	3,6
TOTAL	25	-	12	-	1	-	38	-

The second part of the study took into consideration the period 2010-2014, but this time only in the case of the patients hospitalized in the Romanian University Clinic; in the German Surgical Centre, the ratio between the types of surgical interventions was the same as the one in the first part of the study so we do not included this data in our further study.

During this period, a number of 550 patients were hospitalized with a diagnosis of inguinal hernia. The incidence was 90.4% in men and 9.6% in women, the ratio between the two sexes being the same as the one in the first period. Actually, all of the general data collected about the patients during this period ranged between the same two limits as in the first part of the study. What is different though is the change in terms of the therapeutic options. If, in the first stage, it was the open procedures that were predominant (91%), in the second stage these only accounted for 52%, the remaining 48% being video-endoscopic procedures, and especially the TEP technique (Table 10).

Table 10: Operative techniques during the period 2010-2014

Operative technique	No.	%
Bassini	155	28.1%
Lichtenstein	90	16.3%
McVay	40	7.2%
TEP	265	48%

Discussions

The main aim of our study was to evaluate the way in which we change the surgical technique in the treatment of inguinal hernia during the last 10 years, according to the new guidelines. But still the treatment for inguinal hernia continues to be a controversial one to this day. Although there are treatment guides [7, 8, 9], there still is no consensus regarding the ideal surgical technique, which needs to be adapted to each individual patient. Another factor that influences the results is the learning curve and the experience of each separate surgeon. In the earlier years we performed the standard tissular operative techniques in almost 84% of the cases although the laparoscopic techniques were already on the market. One of the explanation of these situation was the low financial investment in the public health system in our country. The tissular techniques, which suffered small modifications over the course of time, have been known from as early on as the 19th century [10, 11, 12]. However, these techniques are encumbered by a high relapse rate and great postoperative pain [13]. For this reason, over the past few years, the so-called tension-free surgical techniques have experienced a tremendous development [14, 15, 16], with a low relapse rate, with fast postoperative recovery, and lower postoperative pain. The fundamental principle of these techniques is to cover up the deep inguinal orifice via extraperitoneal means, by applying a synthetic prosthesis and fixing it to the muscles. These synthetic materials are biocompatible and have a minimum local impact [17]. These techniques had a limit use in our study, only in about 17% of cases, due to high costs of the meshes used for the repair. The meshes used, were applied in over 90% of the cases in the open surgical technique, only a few of them were used in the laparoscopic way. The laparoscopic techniques (TEP or TAPP) combine the advantages of the tension-free technique with the advantages of the least-invasive surgical approach, which is why they are used ever more frequently [18, 19, 20]. However, surgeons still hesitate to use only these techniques, due to the learning curve and due to the risk of potential complications [21, 22]. Due to a good collaboration with the hospital in Germany, surgeons from the Romanian surgical Department have been learning the laparoscopic technique. As a result, in the recent years, after introducing these new surgical methods, the treatment of inguinal hernia have shifted from the open tissular method to the modern alloplastic techniques, and especially to the laparoscopic application of the mesh. These are evidenced in our study results. At the beginning of the study 90% of cases were alloplastic, after introducing the newer techniques, these were used in over 75% of the cases.

In order to compare the two types of technique, i.e., open versus laparoscopic, the recurrence risk is often used. The main factors that were identified as having the greatest importance in the occurrence of recurrence are: extensive dissection, application of a prosthesis that's too small and which consequently does not cover up the deep orifice sufficiently, the improper fastening of the prosthesis, and last but not least, the lack of surgical experience [23, 24]. The studies quoted above admit the fact that a proper surgical technique, regardless of whether it's of the open or laparoscopic type, offers the patient the same benefits as far as the recurrence rate is concerned. In our study, in both centres, the recurrences were similar 11,2% in Group A respectively 12,7% in Group B. The major differences between the two techniques are given by the postoperative complications and especially by the chronic postoperative pain. This comes as a consequence of certain intraoperative vascular incidents which resulted in a compressive hematoma, or as a result of performing certain large incisions. When comparing tissular technique with laparoscopic, we found out that postoperative pain was significant higher in the tissular methods (16,8%) compared with laparoscopic (10,6%). From the laparoscopic techniques, the TEP method have a lower rate of pain, only in 3,6%. The intensity of pain is also much lower

when using laparoscopic technique. We found only one case with heavy pain in the tissular group but no patient with heavy pain in group laparoscopic method. On the other hand, the delayed pain is the result of certain wounds at the level of the ilio-inguinal or genito-femoral nerves or due to the formation of scar tissue [9]. Thus, minimal trauma on the tissues by performing certain small incisions, careful dissection with the avoidance of trauma on the nerves as well as a more reduced fastening of the prosthesis may reduce, to a certain extent, the chronic postoperative pain. This desideratum may be accomplished by using the laparoscopic techniques. In our study, with the introduction of the tension-free techniques and especially the TEP technique, we have greatly reduced the frequency of postoperative complications and especially the chronic postoperative pain, as compared to the preceding years.

The introduction of the modern surgical techniques for the treatment of inguinal hernia brought about an improvement in the quality of lives in inguinal hernia patients. This was possible due to a faster postoperative recovery, a lower postoperative morbidity, and a much lower relapse risk. These also have an economic impact, by reducing the hospitalization period and, consequently, the health system-related costs.

Our study have also some limits. One of this is the fact that the data collected were not homogenous. The patients were treated by a large number of surgeons, with different basic techniques, learned during their own experience. The hospital did not had his own treatment guidelines. But after integration in the European Union the guidelines were introduced so the data were more homogenous as seen in the second part of the study. Another limitation was the lack of a prospective study. The patient treated many years ago did not benefit of a long term follow-up so could not appreciate accurate the real recurrence rate. This was collected only from some patients files and do not offer us a clear image.

Conclusions

The importance of a proper treatment for inguinal hernia was acknowledged from as early on as the 18th century. The evolution of surgical techniques has been remarkable: from the use of certain metallic suture materials and painstaking tissue dissections, nowadays certain synthetic, perfectly biocompatible materials have come to be used, which are inserted under video-endoscopic control via small or even single incisions [25]. However, there still is no unanimity at this point as far as the optimal treatment for inguinal hernia is concerned.

Nowadays, it is accepted that the alloplastic procedures are the most effective, with reduced consequences on the subsequent evolution of the patients. Of these procedures, the video-endoscopic techniques, and especially the TEP technique, have the least impact on the patient, ensure a substantial reduction of the hospitalization period, allow a fast recovery, and have limited subsequent consequences as far as the chronic postoperative pain is concerned. However, the laparoscopic techniques do have a disadvantage, which is a longer learning curve, and they require more costly equipment as compared to the open surgical techniques.

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. For this type of study formal consent is not required.

This article does not contain any studies with human participants or animals performed by any of the authors.

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