

Long-term results of incisional hernia treatment

Linus Venclauskas, Jolita Šilanskaitė, Jurga Kanišauskaitė, Mindaugas Kiudelis

Department of Surgery, Kaunas University of Medicine, Lithuania

Key words: incisional hernia; keel technique; onlay technique; recurrence rate.

Summary. Ventral hernia is a common problem in general surgery practice. Incisional hernia can develop in 15–25% of patients after abdominal surgery. The aim of this study was to compare two different methods of incisional hernia surgery.

Materials and methods. A retrospective analysis of database of surgery department from 1997 to 2000 was performed. All patients were divided into two groups. The first group patients were operated using open suture repair (keel technique); the second group patients – using open mesh repair (onlay technique). Long-term follow-up was done by a mail questionnaire. A special questionnaire was sent to all patients. Postoperative evaluation included pain and discomfort in the abdomen, physical activity, and recurrence rate after operation. Statistical evaluation was conducted using descriptive analysis: the unpaired Student *t* test to compare parametric criterions between two study groups, Mann-Whitney *U* test to compare the unpaired nonparametric criterions between two study groups, and χ^2 test to investigate nonparametric criterions between these groups.

Results. A total of 202 patients (51 males, 151 females) with incisional hernia were operated during 1997–2000. One hundred seventy-one patients were in the keel technique group, and 31 patients in the onlay technique group. There were no significant differences in age and sex between these groups. The hospitalization time was significantly longer in the open mesh repair group. The postoperative complication (wound seroma and suppuration) rate was significantly higher in the onlay technique group.

One hundred sixty-one patients (79.7%) answered the questionnaire (133 in the keel technique group, 28 the in onlay technique group). The patients' return to physical activity after surgery was significantly longer in the keel technique group. Forty-one patients (31%) had hernia recurrence in the keel technique group and 3 patients (11%) in the onlay technique group ($P < 0.05$). There were no postoperative deaths in both groups.

Conclusions. The rates of postoperative therapeutic complications and hernia recurrence are significantly lower after open mesh repair surgery. Return to normal physical activity after surgery is significantly longer after open suture repair surgery.

Introduction

Ventral hernia is a common problem in general surgery. Incisional hernia can develop in many patients after abdominal surgery procedures. The incidence of primary incisional hernia after laparotomy ranges from 10% to 20% (1, 2). Wound suppuration after abdominal procedures can increase the risk of incisional hernia to 30% (3). This situation accounts for the abundance of different surgery procedures, high postoperative morbidity, and hernia recurrence. For the years, these hernias have been repaired using the open surgery technique that involved either primarily closing under tension or suturing the mesh to the edges of the fascial defect. Incisional hernia repair without prosthesis can result in recurrence rate of 30–50% (1, 2). The

use of different mesh hernia repair can reduce this recurrence rate to 10% (1, 4).

Stoppa introduced the technique, which places prosthetic mesh anterior to the posterior rectus sheath. This technique had favorable results, with recurrence rates of about 14.5%. However, this procedure, involving extensive tissue dissection, has a complication rate of 18% (2).

The aim of our study was to compare two different methods of surgery for incisional hernia and evaluate the morbidity and recurrence rate after these operations.

Materials and methods

A retrospective analysis of patients treated in the Department of Surgery during 1997–2000 was per-

formed. All patients were divided into two groups. The patients of the first group were operated on using open suture repair technique (keel technique). These hernias were repaired using the open technique that involved primarily hernia closing under tension with continuous suture. After the preparation, hernia sac was removed, and abdominal wall defect was closed with nonabsorbable, interrupted suture. Hernioplasty with nonabsorbable and continuous sutures was performed after this procedure. The stitches were put above the hernia about 5 mm from the middle line. The suture was finished below the hernia. The second layer was put above the hernia and was finished below that. The Keel suture technique was repeated until the distance between the rectal muscle borders was 1 cm. We did not use drainage in this patients' group. Subcutaneous layer was sewed on the aponeurosis of the rectal muscle.

The second group patients were operated using the open mesh repair (onlay technique). These hernias were repaired using polypropylene meshes, which were fixated with interrupted sutures on the rectal muscle aponeurosis. After the preparation, hernia sac was removed, and the wall defect was closed with nonabsorbable, continuous suture. The mesh was sewed with nonabsorbable, interrupted sutures. Subcutaneous layer was drained in this group.

Postoperative evaluation included pain and discomfort in the abdomen, recovery time to normal physical activity, and hernia recurrence rate. The question-

naire, which involved all these previously mentioned topics, was sent to all patients' by mail. Hernia recurrence was diagnosed during the patients' visit to surgeon. The patients' follow-up period was 6 to 10 years after the operation.

Statistical evaluation was conducted using descriptive analysis: the unpaired Student t test to compare parametric criterions between two study groups, Mann-Whitney U test to compare the unpaired nonparametric criterions between two study groups, and χ^2 test to investigate nonparametric criterions between these groups. Data are expressed as average and standard deviation. $P < 0.05$ was considered significant.

Results

A total of 202 patients (51 males, 151 females) with incisional hernia were analyzed. One hundred seventy-one patients were in the Keel technique group, and 31 patients were in the onlay technique group. There were no significant differences in age and sex between these groups. The hospitalization time was significantly longer in the open mesh repair group (Table 1). The postoperative surgical complication rate was significantly higher in the onlay technique group. There were no reoperations in both groups; 9.4% of patients in the open suture repair group had pneumonia or respiratory insufficiency after the operation. There were no cases of respiratory insufficiency in the open mesh repair group (Table 2).

Table 1. Patient's age and hospitalization time

Group	Parameters		
	Age (years)		Hospitalization time (days)
	male	female	
Keel technique group (n=171)	57.8±9.4	59.2±11.4	8.5±2.3
Onlay technique group (n=31)	58.1±10.2	61.8±12.4	12.7±6.9
P	P>0.05	P>0.05	P<0.05

Values are mean±SD.

Table 2. Postoperative complications

Parameter	Group		P
	keel technique group, n (%) n=171	onlay technique group, n (%) n=31	
Wound suppuration	15 (9.9)	5 (16.1)	P<0.05
Wound hematoma	20 (11.7)	2 (6.5)	P<0.05
Wound seroma	14 (8.2)	13 (42)	P<0.05
Respiratory insufficiency	12 (16.9)	0	P<0.05
Postoperative pneumonia	4 (2.3)	0	P<0.05

One hundred sixty-one patients (79.7%) answered the questionnaire (133 in the keel technique group, 28 in the onlay technique group). Most of the patients from keel technique group complained of pain or discomfort in the abdomen 1–3 months after the operation (Fig. 1). There was a significant difference between these two groups. The complete patients' recovery time after the operation was significantly longer in the first group (Fig. 2). Forty-one (31%) patients had hernia recurrence in the keel technique group and 3 (11%) patients in the onlay technique group. The recurrence rate was significantly higher

in the keel technique group (Fig. 3). There were no postoperative deaths in both groups.

Discussion

The majority of authors report a mean follow-up period of 3 years after incisional hernia surgery (3–6). Nearly 45% of hernia recurrences develop 2 years after surgery; 74%, after 3 years; 23%, after 4 years; and 3%, after 5 years (3). In our study, we decided to analyze our database until 2000 in order to know exactly the recurrence rate after incisional hernia surgery.

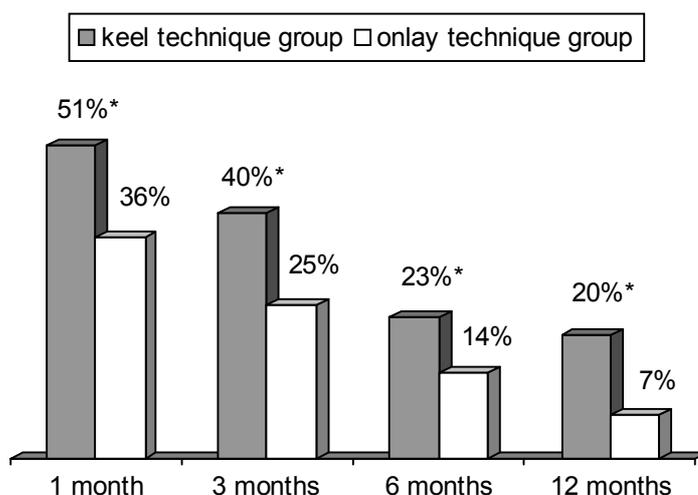


Fig. 1. Patients' complaints after surgery (pain, discomfort in the abdomen)
*P<0.05 keel technique group vs. onlay technique group.

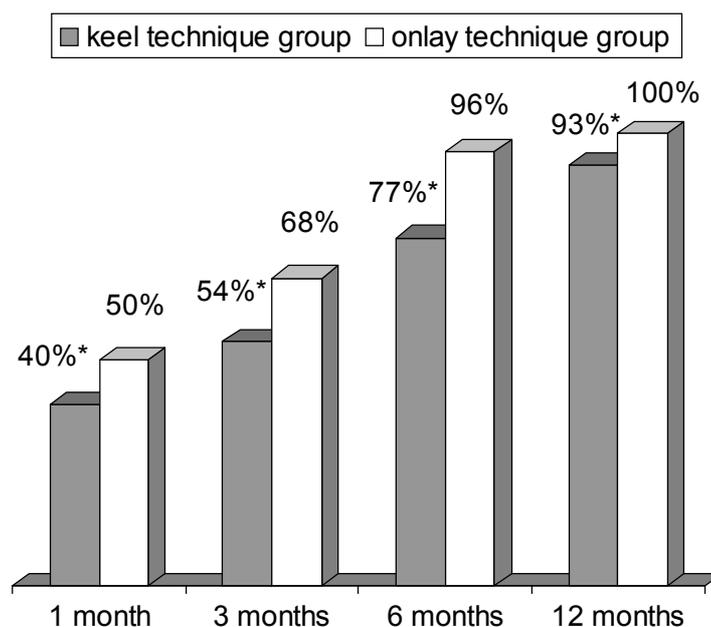


Fig. 2. Return to physical activity after surgery
*P<0.05 keel technique group vs. onlay technique group.

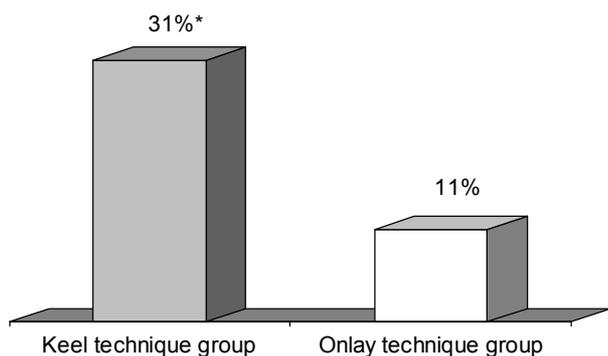


Fig. 3. Recurrence rate

* $P < 0.05$ keel technique group vs. onlay technique group.

The patients' age or gender had no influence on recurrence rate after incisional hernia surgery (5, 7).

Our retrospective study demonstrates significantly longer hospitalization time after operation in the open mesh repair group. Some clinical studies did not find differences in the hospitalization time between these groups (6, 8). Our study results can be explained that we left the drain above the mesh after the open mesh repair operation. The mesh and drainage probably cause more postoperative surgical complications and could prolong hospitalization time. However, it did not increase the risk of recurrence.

Many clinical studies demonstrate a higher postoperative complication rate (wound suppuration, seroma, and fistulas) after open mesh repair (6). Some clinical studies did not find differences between these two surgery techniques (6, 8). In our study, the frequency of wound seroma and suppuration was significantly higher in the open mesh repair group vs. open suture repair group (42% and 16.1% vs. 8.2% and 9.9%, respectively). There were no fistulas in our study. The underlying problem is that using suture repair, the tissues are under tension and this condition increases the risk of tissue ischemia and complicates the postoperative wound healing. However, the mesh, as a foreign body itself, usually is the reason of postoperative wound seroma or fistula after open mesh surgery (6, 9). Some authors speculate that opening the incisional hernia sac during operation can increase wound suppuration, especially formation of intra-abdominal abscess (8, 10). We did not have any intra-abdominal abscesses in our study.

We did not have postoperative pneumonia or respiratory insufficiency in the onlay technique group. Even 9.4% of patients had these postoperative complications in the keel technique group. The type of surgery for incisional hernia is the main cause of these complications. Open mesh repair is a tension-free

technique; therefore, it could not be the reason of the increase in intra-abdominal pressure. In open suture repair surgery, the tissues are under tension, and this leads to increased intra-abdominal pressure and postoperative hypoventilation, complicated with respiratory insufficiency and pneumonia.

The increased intra-abdominal pressure can induce intra-abdominal hypertension. Intra-abdominal hypertension causes hypoperfusion of organs, which is complicated by their insufficiency (11, 12). It is important to measure intra-abdominal pressure before and after incisional hernia surgery in order to prevent postoperative respiratory insufficiency.

Many retrospective clinical studies demonstrate that patients' recovery time to the normal physical activity after incisional hernia surgery is significantly longer in the open suture repair vs. open mesh repair group (4, 10, 13). In our study, we found that patients' recovery time to the normal physical activity was significantly longer in the open suture repair group. In the case of open suture repair, tissues are under the tension. This condition causes postoperative pain or discomfort in the abdominal region and significantly prolongs the recovery time to normal physical activity and aggravates the patient's quality of life.

Danish physicians performed a scientific study with pigs, where mesh during the operation was fixated with special glue. They did not use any sutures. The postoperative results were similar as in the suture group. The authors speculated that postoperative pain was probably caused by sutures, staplers or coils, adhesions, and inflammation occurring around the mesh. It is interesting to note that authors observed no adhesions and no signs of inflammation around the meshes. The meshes were embedded in a uniform connective tissue. Furthermore, the meshes were smooth, flexible, and without signs of migration 8 weeks after surgery (14). This mesh fixation technique can reduce postoperative patients' complains, accelerate recovery to the normal physical activity. This fixation technique has not been introduced in clinical practice yet.

Many clinical studies demonstrated that recurrence rate after incisional hernia surgery was significantly higher in open suture repair group. Luijendijk *et al.* (8) reported a recurrence rate of 46% in open suture repair group vs. 23% in open mesh repair group. Clark (8) reported a recurrence rate of 38% in the open suture repair group vs. 25% in the open mesh repair group. In the study by Koller *et al.* (8), recurrence rate was 63% in open suture group vs. 13% in open mesh repair group (8). Our study showed a similar recurrence rate.

The risk of recurrence increases in obese patients,

especially when their BMI is >35 (3). Only obese patients with hernias >5 cm in diameter had higher failure rates (58%); 73% of them had the recurrence within the first and 95% within the third postoperative year (6).

There are other surgical techniques for incisional hernia. One of them – the mesh is fixated extraperitoneally (subfascialy) – under the rectal muscle. There are few clinical studies which compare open mesh (extraperitoneal) repair vs. open mesh repair (onlay technique) (8). The recurrence rate was similar in both groups. The postoperative complications (wound seroma, hematoma, and suppuration) rates were similar in both groups too. There were more cases of postoperative fistulas in the onlay technique group (8).

A new treatment modality of incisional hernia surgery is laparoscopic hernia repair. More and more clinical studies demonstrate that recurrence rates after laparoscopic incisional hernia repair decrease to 3.3–10% (1, 10). Many clinical studies compare laparoscopic incisional hernia repair with open mesh repair.

These studies demonstrated shorter hospitalization and operation time, fewer postoperative complications, and shorter recovery time to the normal physical activity in the case of laparoscopic technique (1–3, 5, 10). On the other hand, sometimes it is impossible to perform laparoscopic operation in the presence of large postoperative incisional hernias (1).

We could not find any randomized clinical studies about quality of life or recovery time after surgery comparing open mesh repair vs. laparoscopic hernia repair technique or onlay vs. subfascial technique. The success of laparoscopic hernia surgery mainly depends on the incisional hernia size. Laparoscopic surgery is sometimes unsuccessful in large incisional hernias, and open mesh repair is the next choice of surgery.

Conclusions

1. The rates of incisional hernia recurrence are significantly lower after open mesh repair surgery.

2. Return to normal physical activity is significantly longer after open suture repair surgery.

Pooperacinių pilvo sienos išvaržų gydymo vėlyvieji rezultatai

Linās Venclauskas, Jolita Šilanskaitė, Jurga Kanišauskaitė, Mindaugas Kiudelis

Kauno medicinos universiteto Chirurgijos klinika

Raktažodžiai: pooperacinė išvarža, operacija „intraverzijos“ būdu, operacija tinkleliu, pooperacinės komplikacijos.

Santrauka. Pooperacinės pilvo sienos išvaržos yra problema bendrojoje chirurgijoje. Jų randasi 15–25 proc. pacientų po abdominalinių operacijų.

Darbo tikslas. Palyginti du skirtingus chirurginio gydymo metodus pacientams, kurie buvo operuoti dėl pooperacinės pilvo sienos išvaržos.

Medžiagos ir metodai. Atlikta retrospektyvioji analizė ligos istorijų 202 pacientų, operuotų dėl pooperacinės pilvo sienos išvaržos 1997–2000 m. Pacientai buvo suskirstyti į dvi grupes. Pirmos grupės pacientai operuoti naudojant „intraverzijos“ siūlę. Antros grupės pacientai operuoti naudojant nesirezorbuojantį tinklelį. Visiems pacientams buvo išsiųstos specialios anketos, kuriose buvo vertinami pacientų skundai (skausmai, diskomfortas pooperacinio rando srityje), ligos atkrytis po operacijos, taip pat vertintas laikas, kada pacientas po operacijos buvo visiškai darbingas. Statistiniams skaičiavimams taikytas Stjudento (t) kriterijus palyginti parametrinius kriterijus nepriklausomoms imtims tarp abiejų grupių, Mann-Whitney U testas taikomas palyginti neparametrinius kriterijus nepriklausomoms imtims tarp abiejų grupių. Neparametriniams kriterijams apskaičiuoti abiejose grupėse taikytas chi kvadrato (χ^2) testas.

Rezultatai. 1997–2000 m. Kauno medicinos universiteto klinikų Chirurgijos klinikoje operuoti 202 pacientai (51 vyras, 151 moteris) dėl pooperacinės pilvo sienos išvaržos. Pirmoje grupėje buvo operuoti 171, antroje – 31 pacientas. Abiejų grupių pacientų amžius statistiškai reikšmingai nesiskyrė. Gydymo stacionare trukmė statistiškai ilgesnė „tinklelio“ grupėje. Pooperacinių komplikacijų statistiškai reikšmingai daugiau buvo „tinklelio“ grupėje. Į klausimus atsakė 161 pacientas (79,7 proc.): 133 pacientai iš „intraverzijos“ grupės, 28 – iš „tinklelio“ grupės. Visiško pasveikimo laikas po operacijos statistiškai reikšmingai ilgesnis buvo „intraverzijos“ grupės. Išvaržos atkrytis „intraverzijos“ grupėje nustatytas 41 (31 proc.) pacientui, „tinklelio“ grupėje – 3 (11 proc.) pacientams ($p<0,05$). Po operacijos nemirė nė vienas pacientas.

Išvados. Pooperacinių pilvo sienos išvaržų gydymui naudojant tinklelį, pacientai po operacijos turi mažiau skundų palyginus su „intraverzijos“ gydymo metodu. Kvėpavimo sistemos komplikacijų, atkryčių dažnis yra statistiškai reikšmingai mažesnis, o grįžimo į normalią fizinę veiklą laikotarpis trumpesnis taikant operacinę metodiką su tinkleliu.

Adresas susirašinėti: L. Venclauskas, KMU Chirurgijos klinika, Eivenių 2, 50009 Kaunas
El. paštas: linasvenclauskasg@yahoo.com

References

1. Frantzides CT, Carlson MA, Zagrofikis JG, Madan AK, Moore RE. Minimally invasive incisional herniorrhaphy. *Surg Endosc* 2004;18:1488-91.
2. Bower CE, Reade CC, Kirby LW, Roth JS. Complications of laparoscopic incisional-ventral hernia repair. *Surg Endosc* 2004;18:672-5.
3. Anthony T, Bergen PC, Kim LT, Henderson M, Fahey T, Rege RV, et al. Factors affecting recurrence following incisional herniorrhaphy. *World J Surg* 2000;24:95-101.
4. Goodney PP, Birkmeyer CM, Birkmeyer JD. Short-term outcomes of laparoscopic and open ventral hernia repair. *Arch Surg* 2002;137:1161-5.
5. Carbajo MA, Martin del Olmo JC, Blanco JI, de la Cuesta C, Toledano M, Martin F, et al. Laparoscopic treatment vs. open surgery in the solution of major incisional and abdominal wall hernias with mesh. *Surg Endosc* 1999;13:250-2.
6. Paul A, Korenkov M, Peters S, Kohler L, Fischer S, Troidl H. Unacceptable results of the Mayo procedure for repair of abdominal incisional hernias. *Eur J Surg* 1998;164:361-7.
7. Luijendijk RW, Lemmen MHM, Hop WCJ, Wereldsma JCJ. Incisional hernia recurrence following “vest-over-pants” or vertical Mayo repair of primary hernias of the midline. *World J Surg* 1997;21:62-6.
8. Cassar K, Munro A. Surgical treatment of incisional hernia. *Br J Surg* 2002;89:534-45.
9. Leber GE, Garb JL, Alexander AI, Reed WP. Long-term complications associated with prosthetic repair of incisional hernias. *Arch Surg* 1998;133(4):378-82.
10. Gupta A, Zahriya K, Mullens PL, Salmassi S, Keshishian A. Ventral herniorrhaphy: experience with two different biosynthetic mesh materials, Surgisis and Alloderm. *Hernia* 2006;10(5):419-25.
11. Malbrain ML. Different techniques to measure intra-abdominal pressure (IAP): time for critical re-appraisal. *Intensive Care Med* 2004;30:357-71.
12. Šerpytis M, Ivaškevičius J. Intraabdominalinė hipertenzija ir dauginis organų disfunkcijos sindromas. (Intra-abdominal hypertension and polyorganic dysfunction syndrome.) *Medicina (Kaunas)* 2005;41(11):903-9.
13. van't Riet M, Burger JWA, Bonthuis F, Jeekel J, Bonjer HJ. Prevention of adhesion formation to polypropylene mesh by collagen coating. *Surg Endosc* 2004;18:681-5.
14. Schulze S, Kristiansen VB, Hansen BF, Rosenberg J. Biological tissue adhesive for mesh-application in pigs: an experimental study. *Surg Endosc* 2005;19:342-4.

Received 7 February 2007, accepted 13 November 2007

Straipsnis gautas 2007 02 07, priimtas 2007 11 13