

# Early results of comparison of polypropylene mesh and 75% resorbable mesh (monofilament polypropylene and poly-L-lactic acid (PLLA) mesh) for laparoscopic total extraperitoneal (TEP) inguinal hernia repair

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## ABSTRACT

**OBJECTIVE:** Laparoscopic totally extraperitoneal (TEP) hernia repair has become increasingly widespread. Faster recovery than conventional open methods shortens the return to work. Polypropylene (PP) mesh is still in use in hernia surgery because it is an inexpensive and easily accessible patch. The post-operative chronic pain and foreign body sensation are the disadvantages of these PP patches. Poly-L-lactic acid and polypropylene (PLLA) were used in this study because of the good biocompatibility and low tissue inflammation response. We compared the early clinical outcomes of PP patch and PLLA patches.

**METHODS:** Between January 2013 and April, 2018, 469 patients with inguinal hernia underwent TEP procedure. Patients were divided into two groups. PP mesh (n=211) in group 1, PLLA mesh (n=258) in group 2. Patients were compared regarding age, gender, hernia side, ASA scores, the duration of operation, pain, time to return to work, the sensation of foreign body, seroma and hematoma.

**RESULTS:** A total of 469 patients were analyzed retrospectively (426 male, 43 female). The mean age was 52.23±13.66 years. The operative times of the patients were 40.92±8.9 minutes in group 1, and 38.82±8.5 minutes in group 2 (p<0.05). The time to return to work was 10.2±1.47 days in Group 1 and 8.4±1.0 days in Group 2 (p<0.05). Visual Analog Scale (VAS) in group 2 was lower than in group 1 (p<0.005). In group 2, the feeling of the organic body decreased in the early and late period (p<0.005). Seroma and hematoma were less in Group 2 than in Group 1 (p<0.005). The mean follow-up period of the patients was 18 (3-63) months, two patients in Group 1, two patients in Group 2 recurred.

**CONCLUSION:** The PLLA patch used in the TEP method is thought to be a herniated patch that can be safely used because of its ease of application and less postoperative complication rates and more rapid return to work.

*Keywords:* Laparoscopic hernia repair; mesh; poly-L-lactic acid.

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An inguinal hernia is seen in 5-7% of the general population, and it is one of the most frequently treated illnesses in general surgery [1]. Every year, 20 million cases of inguinal hernia are treated around the world, and it is truly a critical factor in the financial aspect of health services [2]. Also, providing the patient with a certain level of comfort is another important factor in an active working group of the population. In

the surgery of inguinal hernia, there are many different defined techniques from open ones to minimal invasive attempts. Today, the best results are taken with tension-free patched repair. Lichtenstein repair and laparoscopic mesh repair are the most frequently used methods with this technique. Since these techniques are defined, different firms released different materials, different patches from different supplies, and differently



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formed products [3]. Polypropylene (PP) patches are the most frequently preferred products because they are easily and cheaply available and provide enough strength for the technique. However, chronic pain and feel of a foreign object are among the adverse effects of this kind of patch after the surgery [4]. It is thought that patch's thickly knitted and porous structure causes intense inflammation, thus creating tough scar tissue and consequently disrupting the elasticity of the abdominal wall, hence causing discomfort for the patient [5]. To prevent these disadvantages, different composite patches are produced as an alternative to this patch. Experimental studies showed that patches which are combined with poly-L-lactic acid (PLLA) are a good alternative to non-absorbent patches because of less inflammation response, biocompatible nature and lower relapse potential [6]. In this study, we aimed to compare the differences between the use of PP patch and PLLA patch regarding early period clinic results after a unilateral hernia repair surgery carried out with the method of laparoscopic total extraperitoneal.

## MATERIALS AND METHODS

Between January 2013 and April 2018, 469 unilateral inguinal hernia patients were treated with elective TEP. Twenty-two of them were patients who had open hernia repair before and had relapsed. Patients treated with TEP were retrospectively documented. Emergency cases and ASA IV patients were excluded from this study. All patients were operated by two expert surgeons in laparoscopic hernia surgery (100 cases/year). Patients who did not experience preoperative complications were discharged after the first-day post-surgery. In the first week and third month, patients were checked in the outpatient clinic. In the third month, patients who did not come to their clinic were reached by phone to check. On 211 patients, polypropylene patch was used, and they were named Group-1. On 258 patient resorbable monofilament polypropylene and poly-L-lactic Acid (4 D Mesh R, Cousine Biotech) were used, and they were defined as Group-2. Groups were compared according to their age, sex, side of hernia, ASA scores, duration of surgery, Visual Analogue Scale (VAS) pain scores after the first day and third month of the surgery, time of getting back to work, foreign object feeling on the first day and the third month, seroma-hematoma. In our study, the cost analysis was not performed.

## Statistical Analysis

During the evaluation of the findings obtained for this research, IBM SPSS Statistics 22 (IBM SPSS, Turkey) software was used. Study data were also evaluated using Shapiro Wilks test to see if the parameters were normally distributed. During the evaluation process, definitive statistical methods (mean, standard deviation, frequency) was used along with Student t-test to compare normally distributed parameters between groups; also Mann-Whitney U test was used to compare non-normally distributed parameters between two groups to evaluate quantitative data. During the comparison of qualitative data, chi-square test and Continuity (Yates) Correction was used. Significance was evaluated at the level of  $p < 0.05$ .

## RESULTS

This research was conducted with the retrospective analysis of 469 cases (426 male and 43 female patients), aged between 19 and 94. The average age was  $52.23 \pm 13.66$  years. ASA scores varied between I and III. In 196 of them, hernia side was right, and 273 of them was left. Duration of the surgery took  $40.92 \pm 8.9$  and  $38.82 \pm 8.5$  minutes for Group 1 and Group 2, respectively. Group 2's operation time was shorter than Group 1, and the difference was statistically significant ( $p = 0.009$ ). No significant difference was found between their day of the hospitalization. Their times of getting back to work were asked at their third-month clinic checks. For old patients and unemployed cases, doing housework comfortably by themselves and taking walks outside was regarded as getting back to work. In Group 2, it took less time than Group 1, and it is statistically significant ( $p < 0.005$ ) (Table 1). In VAS scores, Group 2's data was lower than Group 1 at the first day after surgery and third month after it, and it is statistically significant ( $p < 0.005$ ). Patients answered the following question: "Do you feel a foreign object in the operated inguinal region?" as yes or no. In Group 2, feeling of a foreign object was less in both early and late period and the difference was statistically less (first day and third month, respectively:  $p < 0.005$  and  $p < 0.005$ ). Seroma or bleeding, sore or swelling in operated area or ecchymosis was checked at the first day and third month after the surgery. Asymptomatic cases were followed conservatively. This evaluation was carried out clinically and radiologically. Seromas were cleaned with aspiration. Three patients (one in Group 1 and two in

**TABLE 1.** Characteristics of patients undergoing inguinal hernia repair in groups

	Group 1 (n=211)	Group 2 (n=258)	p
	Mean±SD (median)	Mean±SD (median)	
Mean age (years)	52.45±14.02	52.05±13.38	10.756
Sex, n (%)			
Male	189 (89.6)	237 (91.9)	30.393
Female	22 (10.4)	21 (8.1)	
Hernia side, n (%)			
Right	84 (39.8)	112 (43.4)	30.432
Left	127 (60.2)	146 (56.6)	

<sup>1</sup>Student t-Test; <sup>2</sup>Mann-Whitney U Test; <sup>3</sup>Chi-square Test; \*p<0.05.

Group 2) were subject to hemostasis and wound site exploration because of hematoma at the first day after surgery. In Group 2, seroma and bleeding lasted shorter than Group 1 at both first day and third month; the difference was statistically significant ( $p<0.05$ ). The mean follow-up time was 18 months (range 3 to 63 months). During this phase, two cases had a recurrence in Group 1 (0.94%) and Group 2 (0.77%), which was not statistically significant ( $p=0.646$ ) (Table 2).

**TABLE 2.** Data of the groups

	Group 1 Mean±SD (median)	Group 2 Mean±SD (median)	p
VAS			
0	7.62±0.68 (8)	7.33±0.74 (7)	10.000*
3 <sup>rd</sup> month	2.83±0.62 (3)	2.49±0.67 (2)	10.000*
Seroma/ hemorrhagen, (%)			
0	47 (22.3)	26 (10.1)	20.000*
3 <sup>rd</sup> month	16 (7.6)	6 (2.3)	30.014*
Foreign body sensationn, (%)			
0	117 (55.5)	67 (26)	20.000*
3 <sup>rd</sup> month	71 (33.6)	36 (14)	20.000*
Recurrence, n (%)	2 (0.94)	2 (0.77)	20.646

<sup>1</sup>Mann-Whitney U Test; <sup>2</sup>Chi-square Test; <sup>3</sup>Continuity (Yates) Correction;  
\*p<0.05.

## DISCUSSION

In the daily practice of general surgery, apart from a few emergency surgery procedures, inguinal hernia surgery is one of the most frequently operated types of surgery. Every year, over 20 millions of surgeries were estimated to happen [2, 7]. Various surgery techniques are defined with open and closed methods. We should note that despite this, relevant studies in the literature showed that various techniques have been described by open and laparoscopic methods. However, only surgical technique does not contribute to patient satisfaction [8]. The requirement of using the patch in inguinal hernia surgery is not a controversial practice today because it significantly prevents relapse [9]. Existence of chronic pain caused many different types of patches to be used when long terms results are considered, and still, there is a search for an ideal patch [3]. Because polypropylene causes advanced inflammation and disrupts patient comfort in the long term, completely absorbable composite patches are being discussed [10, 11]. As of today, there are more than 130 patch varieties offered. Essential differences between them are material, weight, and pore diameter. Most widely used material is polypropylene patches with polymerized propylene chains. Other material types include synthetic polyester polymer material polyethylene terephthalate (PET) and expanded polytetrafluoroethylene (PTFE) and partially absorbable poliglecaprone polypropylene [12]. During our research, we retrospectively scrutinized the clinic results of a partially absorbable patch with poly-L-lactic acid which Yoon SD et al. [6] and Tanaka K et al. [13] showed that it provides good results in inguinal hernia surgery experimentally. In our research, the average age is  $52.23\pm 13.66$  years, and male/female ratio is 90,8% (246/269). This age-gender and ASA distributions show similarities with previously conducted local research [14]. Regarding hernia side, the left is more frequent in both groups, and all patients although literature says hernia on the right side is more widespread [15, 16]. When similar examples to this research in the literature are examined, we can see that types of different patches affected the duration of the procedure. However, this effect is attributed to the experience of the surgical team or the heterogeneous nature of the patient group. Bringman et al. [17] conducted prospective clinical research to compare two different with a sample size of 139 cases and found that the duration of operation was significantly different between two types of patches. However,

this difference was attributed to that the number of cases between the two groups was homogeneous and because of the fastest surgeon in the research. Prassas et al. [12] attributed to the difference of time to gender distribution between two groups (in males, dissection of spermatic cord structures taken time). In our research, the findings showed that PLLA used operations significantly lasted shorter. However, because of the retrospective nature of this research, we attribute the difference to heavy use of PP in the first years and more skillful use of PLLA patch after passing the learning curve. The findings showed that the time needed to get back work was shorter in a statistically significant fashion in PLLA patients. We attribute the difference to a smaller feel of a foreign object and a lower pain score. Talha et al. [16] emphasized that less pain shortens the time needed to get back to work in a study in which they compare composite Ultrapro™ and non-absorbent 3D Max™, and composite group causes less pain. Choybey et al. [18] emphasized that Ultrapro™ group had less pain and did a faster return to normal activity in TEP research they carried out with Prolen™ and Ultrapro™. However, in a multicenter study comparing Prolen™ and Vypro II™, there was no effect of two different patches on the time to return to work [19].

When VAS results were considered, it was found that PLLA group patients had less pain at both first day and third month. We think that patch's thickly knitted and porous structure causes intense inflammation, thus creating tough scar tissue and consequently disrupting the elasticity of the abdominal wall and causes the difference. Similarly, another research comparing non-absorbable PP patch and a partially absorbable patch showed after preperitoneal classic inguinal hernia repair that partially absorbable patch patients had less pain in early and late periods [16]. Polish Hernia Group published another research that randomized 600 cases in 15 centers and showed that partially absorbable light composite mesh caused less pain than heavy-weight polypropylene patch [20]. Another research found no difference between the use of the composite patch and PP [17]. When two groups were evaluated regarding seroma/hematoma, early and late results were statistically less significant in PLL-PP group (First day- 47 (22.3%) vs 26 (10.1%), Third month- 16 (7.6%) vs 6 (2.3%), Group 1 vs Group 2). Bangash et al. [21] compared composite polypropylene and polypropylene patch in randomized research and found that the PP group had more seroma. In a recent review with big case

series concluded no risk factor in this about patch type [22]. We think that polypropylene's porous and thickly knitted structure causes seroma and hematoma because it serves as a secondary barrier for inflammation. Foreign object feeling is felt more in PP used Group 1 in both early and late period because of quick fibrosis reaction. These findings showed that in PP groups, foreign object feel is more as in two other comparative studies that look into composite and PP patches [16, 23].

## Conclusion

In laparoscopic inguinal hernia repair, PLLA patch is a safe option for its applicability in short time because it causes less pain and gets people back to work faster, and also less seroma development and foreign object feel but our results should also be supported by randomized controlled research findings.

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## REFERENCES

1. Pahwa HS, Kumar A, Agarwal P, Agarwal AA. Current trends in laparoscopic groin hernia repair: A review. *World J Clin Cases* 2015;3:789–92.
2. Fitzgibbons RJ, Richards AT, Quinn TH. Open hernia repair. In: Souba WS, Mitchell P, Fink MP, Jurkovich GJ, Kaiser LR, Pearce WH, et al, editors. *ACS Surgery: Principles and Practice*. 6th ed. Philadelphia, USA: Decker Publishing; 2002. p. 828–49.
3. Brown CN, Finch JG. Which mesh for hernia repair? *Ann R Coll Surg Engl* 2010;92:272–8.
4. Klinge U, Klosterhalfen B, Müller M, Schumpelick V. Foreign body reaction to meshes used for the repair of abdominal wall hernias. *Eur J Surg* 1999;165:665–73.
5. Sajid MS, Kalra L, Parampalli U, Sains PS, Baig MK. A systematic review and meta-analysis evaluating the effectiveness of lightweight mesh against heavyweight mesh in influencing the incidence of chronic groin pain following laparoscopic inguinal hernia repair. *Am J Surg* 2013;205:726–36.
6. Yoon SD, Kwon YS, Lee KS. Biodegradation and Biocompatibility of Poly L-lactic Acid Implantable Mesh. *Int Neurorol J* 2017;21:S48–54.
7. Kulacoglu H. Current options in inguinal hernia repair in adult patients. *Hippokratia* 2011;15:223–31.
8. Romain B, Gillion JF, Ortega-Deballon P, Meyer N; Club Hernie. Patient's satisfaction at 2 years after groin hernia repair: any difference ac-



- cording to the technique? *Hernia* 2018;22:801–2.
9. EU Hernia Trialists Collaboration. Mesh compared with non-mesh methods of open groin hernia repair: systematic review of randomized controlled trials. *Br J Surg* 2000;87:854–9.
  10. Ruiz-Jasbon F, Norrby J, Ivarsson ML, Björck S. Inguinal hernia repair using a synthetic long-term resorbable mesh: results from a 3-year prospective safety and performance study. *Hernia* 2014;18:723–30.
  11. Paajanen H, Rönkä K, Laurema A. A single-surgeon randomized trial comparing three meshes in lichtenstein hernia repair: 2- and 5-year outcome of recurrences and chronic pain. *Int J Surg* 2013;11:81–4.
  12. Prassas D, Rolfs TM, Sirothia N, Schumacher FJ. Lightweight Titanium-coated Mesh Versus Standard-Weight Polypropylene Mesh in Totally Extraperitoneal Inguinal Hernia Repair (TEP): A Cohort Analysis. *Surg Laparosc Endosc Percutan Tech* 2016;26:e113–6.
  13. Tanaka K, Mutter D, Inoue H, Lindner V, Bouras G, Forgione A, et al. In vivo evaluation of a new composite mesh (10% polypropylene/90% poly-L-lactic acid) for hernia repair. *J Mater Sci Mater Med* 2007;18:991–9.
  14. Tanrıverdi HO, Cengiz F, Yakan S, Şenlikçi A, Üstüner MA, İlhan E. Can laparoscopic total extraperitoneal repair of inguinal hernia be preferred to conventional method? A randomized clinical trial. *J Clin Exp Invest* 2013;4:80–3.
  15. Schopf S, von Ahnen T, von Ahnen M, Schardey H. Chronic pain after laparoscopic transabdominal preperitoneal hernia repair: a randomized comparison of light and extralight titanized polypropylene mesh. *World J Surg* 2011;35:302–10.
  16. Nyuwi KT, Singh CG, Khumukcham S, Rangaswamy R, Ezung YS, Chittvolu SR, et al. The Role of Serum Fibrinogen Level in the Diagnosis of Acute Appendicitis. *J Clin Diagn Res* 2017;11:PC13–5.
  17. Bringman S, Wollert S, Osterberg J, Heikkinen T. Early results of a randomized multicenter trial comparing Prolene and VyproII mesh in bilateral endoscopic extraperitoneal hernioplasty (TEP). *Surg Endosc* 2005;19:536–40.
  18. Chowbey PK, Garg N, Sharma A, Khullar R, Soni V, Bajjal M, et al. Prospective randomized clinical trial comparing lightweight mesh and heavyweight polypropylene mesh in endoscopic totally extraperitoneal groin hernia repair. *Surg Endosc* 2010;24:3073–9.
  19. Heikkinen T, Wollert S, Osterberg J, Smedberg S, Bringman S. Early results of a randomised trial comparing Prolene and VyproII-mesh in endoscopic extraperitoneal inguinal hernia repair (TEP) of recurrent unilateral hernias. *Hernia* 2006;10:34–40.
  20. Polish Hernia Study Group, śmietański M. Randomized clinical trial comparing a polypropylene with a poliglecaprone and polypropylene composite mesh for inguinal hernioplasty. *Br J Surg* 2008;95:1462–8.
  21. Bangash A, Khan N, Sadiq M. Composite polypropylene mesh versus lightweight polypropylene mesh: The TAPP repair for laparoscopic inguinal hernia repair. *J Sci Soc* 2012;39:64–9.
  22. Köckerling F, Bittner R, Adolf D, Fortelny R, Niebuhr H, Mayer F, et al. Seroma following transabdominal preperitoneal patch plasty (TAPP): incidence, risk factors, and preventive measures. *Surg Endosc* 2018;32:2222–31.
  23. Post S, Weiss B, Willer M, Neufang T, Lorenz D. Randomized clinical trial of lightweight composite mesh for Lichtenstein inguinal hernia repair. *Br J Surg* 2004;91:44–8.