International Surgery Journal
George R et al. Int Surg J. 2019 Aug;6(8):2716-2721
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: http://dx.doi.org/10.18203/2349-2902.isj20193314

Original Research Article

Reverse darning technique: an effective and innovative method of inguinal hernia repair

Robinson George[1], Veerabhadra Radhakrishna[2]*, Mebin Mathew[1], Ashna Rahman[1], Aswini Thenamangalath[1]

[1]Department of General Surgery, Al Azhar Medical College, Idukki, Kerala, India
[2]Department of Pediatric Surgery, Bangalore Medical College and Research Institute, Bengaluru, Karnataka, India

Received: 10 May 2019
Revised: 30 June 2019
Accepted: 01 July 2019

***Correspondence:**
Dr. Veerabhadra Radhakrishna,
E-mail: vbrps2016@gmail.com

ABSTRACT

Background: Laparoscopic mesh repair is the standard of care for inguinal hernias. But, our center being in a rural setup catering mainly poor patients who are daily wagers and laborers, open repairs are commonly done. Lichtenstein's tension-free mesh repair is the standard technique used worldwide. This study was performed to compare the effectiveness of Reverse darning repair over traditional mesh repair in a rural setup and to reciprocate the changes generally. The outcomes such as postoperative pain, seroma formation, postoperative analgesic use, and the recurrence rate were compared.
Methods: Retrospective analysis of patients who had undergone mesh repair and reverse darning procedure between January 2013 and December 2017 was performed in a rural tertiary center.
Results: The reverse darning group was found to have significantly lesser mean duration of surgery (15.7±1.7 min. vs. 31.2±2.5 min.; t=37.4, p<0.005), analgesic use (4.4±1.2 doses vs. 7.4±1.3 doses; t=12.2, p<0.005), hospital stay (39.4±8.2 hours vs. 58.1±9.5 hours; t=10.7, p<0.005), and the cost of treatment (Rs. 5188±286 vs. Rs. 7154±1290; t=11.6, p<0.005) compared to the Lichtenstein group. The Reverse daring group was also better than Lichtenstein repair in terms of seroma formation (1 vs. 7; chi-square value=7.9; p=0.005), hematoma (0 vs. 6; chi-square value=9.4, p=0.002), and secondary hydrocele (1 vs. 5; chi-square value=4.9, p=0.03).
Conclusions: Reverse darning repair was found to be much better than traditional mesh repair due to its simplicity, lesser duration of surgery, hospital stay, cost of treatment, and postoperative complications.

Keywords: Reverse darning, Lichtenstein mesh repair, Tension free, Seroma, Rural

INTRODUCTION

Hernia (Greek: kele/hernios--bud or offshoot) has been omnipresent in human history from its genesis. The surgical role was restricted to the treatment of huge umbilical and groin hernias and life-threatening incarcerated hernias. Inguinal hernias are the commonest of all hernias, surgery is the definitive treatment, and hernia repair is the most commonly performed general surgical procedure in clinical practice. Despite the high frequency of this procedure, very few have ideal results and post-operative complications. The frequent occurrence of hernia in the inguinal region, the enigma of the etiology and selection of treatment method make it one of the significant parts of surgical practice.[1-5]

The treatment of hernias especially, groin variety, can be divided into five eras. The oldest one was from hallowed Egypt to the 15th century. The Egyptian Papyrus of Ebers (circa 1552 BC) contains a description of the hernia:

swelling that comes out during coughing. The mummy of Ramses 5th an Egyptian Pharaoh shows a hernial sac in his groin. Most essential knowledge concerning hernias in ancient times derives from Galen. This finding with minor modifications was valid during the middle ages and eventually, in the period of the renaissance, the second era of treatment began. The repair flourished mainly, due to many significant breakthrough anatomical discoveries. Sir Astley Cooper stated that, "No disease of the human body, belonging to the province of the surgeon, requires in its treatment a greater combination of accurate anatomic knowledge, with surgical skill, than hernia in all its varieties".[6]

Introduction of anesthesia and antiseptic procedures constituted the beginning of modern hernia surgery known as an era of hernia repair, albeit, under tension (19th to mid-20th century). Three basic rules were kept to repair techniques: asepsis, high ligation of hernia sac and narrowing of the internal ring. In spite of the progress, the results were deemed unsatisfactory. The results showed minimum progress after a new surgical technique described by Bassini was demonstrated. He introduced the next rule of hernia repair i.e., reconstructing the posterior wall of the inguinal canal. The next landmark in inguinal hernia surgery was the method described by a Canadian surgeon E. Shouldice. He proposed an imbrication of the transverse fascia and strengthening of the posterior wall of the inguinal canal by four layers of fasciae and aponeuroses of oblique muscles. These modifications decreased recurrence rate to 3%.[6]

The next epoch in the history of hernia surgery lasting to present days is referred to as an era of tensionless hernia repair. The tension of sutured layers was reduced by incisions on the rectus abdominis muscle sheath or the use of foreign materials via meshes. The turning point in hernia surgery was the discovery of synthetic polymers by Carothers in 1935. The first tensionless technique described by Lichtenstein was based on the strengthening of the posterior wall of the inguinal canal with a prosthetic material. Lichtenstein published the data on 1,000 operations with Marlex mesh, without any recurrence in 5 years after surgery. Thus, a new technique of repair was introduced-tensionless repair. Another treatment method was popularized by Rene Stoppa in 1975, by placing a mesh situated at a preperitoneal level over Fruchaud's myopectineal orifice without sutures. The next was the introduction of a prolene hernia system (PHS) which enabled repair of the tissue defect in three spaces: preperitoneal, above transverse fascia and inside the inguinal canal. Laparoscopy, made its foray into the treatment of groin hernias in the 20th century. The first laparoscopic procedure was performed by P. Fletcher in 1979. Later methods like transabdominal preperitoneal (TAPP) and totally extraperitoneal (TEP) repair were introduced. The disadvantages of laparoscopic approach were high cost and the risk connected with general anesthesia (reverse Trendelenburg position).[6]

Many comparative randomized trials have demonstrated the superiority of the tension-tree mesh repair over the traditional tissue approximation method. However, methods like Bassini's have advantages of being simple and cost effective. We surgeons, as a group, have positively moved away from 'technical success' in the form of low recurrence rates as an outcome measure and have assessed other end points. Our studies have moved from the least recurrence rates to least complication rates in the most cost effective manner.

The darning technique has been recently introduced, which doesn't require mesh yet gives satisfactory results. We performed a new technique, the reverse darning, and compared it with classical mesh repair with reference to the duration of surgery, hospital stay, the cost of treatment, complications, and recurrence rate.

METHODS

A retrospective analysis was carried out in a rural tertiary centre, Al Azhar Medical College Hospital, India. The patients who underwent inguinal hernia repair over a period of five years from January 2013 to December 2017 were included in the study. The patients with incomplete data, the patients less than 18 years old, the patients who underwent repair for recurrent hernias, and repairs other than reverse darning or Lichtenstein repair were excluded from the study. The hospital records were checked for age at surgery, gender, associated co-morbidity, type of inguinal hernia, method of hernia repair, duration of surgery, postoperative analgesic use, the hospital stay, and the total cost of treatment. The complications such as seroma, hematoma, secondary hydrocele, wound infection, and recurrence were documented.

Only spinal anesthesia was administered in all these patients.

Classical incision was used i.e., 1.25 cm above and parallel to the medial three fifths of the inguinal ligament (right / left depending on side of hernia).

Reverse darning repair- after the incision, the layers were dissected to reach the inguinal canal. Sac was identified, dissected, and reduced. '1-0' prolene stitch (key stitch) was taken through pubic tubercle periosteum (Figure 1) and recurring sutures were placed through conjoint tendon and the reflected part of inguinal ligament up to the deep ring (Figure 2). Then the suture was run backwards (reverse) on the same line with minimum bites up to the first stitch (Figure 3).

Lichtenstein repair- after dissection of the sac, the polypropylene mesh was placed on the defect and fixed to the inguinal ligament below and to the conjoint tendon above with '1-0' polypropylene suture.

Post-operatively, oral paracetamol was given as analgesia on an as-needed basis for 24 hours to both the groups.

The patients were evaluated for post-operative seroma collection, hematoma and secondary hydrocele. They were discharged on post-operative day-1 or day-2. Skin sutures were removed on the 7th day post-operatively. The patients were followed up once every month for the first three months, three-monthly till the end of one year, and then yearly for five years to examine recurrence.

Statistical analysis

"IBM SPSS statistics for windows, Version 22.0. Armonk, NY: IBM Corp." was used to analyze the data. The gender, associated co-morbidity, the type of inguinal hernia, and the method of hernia repair were expressed in number and percentage. The complications such as seroma, hematoma, secondary hydrocele, wound infection, and recurrence rate were also expressed in number and percentage. The age at presentation, duration of surgery, postoperative analgesic use, the hospital stay, and the total cost of treatment were expressed in mean±standard deviation.

The two groups, reverse darning and mesh repair, were compared using the chi-square test and independent sample 't' test. The difference between the groups was considered significant if the 'p' value was less than 0.05 (confidence interval 95%).

RESULTS

A total of 118 patients underwent inguinal hernia repair during the study period. Fourteen patients were excluded from the study (Incomplete data=8, recurrent hernias=6). Amongst the 104 patients studied, 62 patients underwent Reverse Darning procedure while 42 underwent Lichtenstein tension-free mesh repair.

The mean age of the study population was 56 years±4 years. Males were predominant (88:16). Five (5%) patients had diabetes while 11 (11%) had hypertension and 11 (11%) had chronic obstructive pulmonary disease. Fifty-nine (57%) had an indirect inguinal hernia while 45 (43%) had a direct inguinal hernia. Reverse darning repair was performed in a total of 62 (60%) patients and Lichtenstein repair was done in 42 (40%) patients. The mean duration of surgery was 22 minutes±8 minutes. The mean number of doses of analgesic used was 5.6±1.9. The mean hospital stay was 47 hours±13 hrs. The mean cost of treatment was Rs. 5,981±1,285. Eight (8%) patients had seroma, six (6%) had hematoma, six (6%) had secondary hydrocele, and two (2%) had surgical site infection. None of the patients had recurrence or chronic pain with follow up period ranging from one to five years (Table 1).

Table 1: Clinico-demographical parameters.

Variables	Mean±standard deviation or number (%)
Mean age (years)	56±4
Gender (years)	
Males	88 (85)
Females	16 (15)
Co-morbidities	
Diabetes	5 (5)
Hypertension	11 (11)
COPD[a]	11 (11)
Types of hernia	
Indirect	59 (57)
Direct	45 (43)
Repair	
Reverse darning repair	62 (60)
Lichtenstein repair	42 (40)
Mean duration of surgery	22±8 minutes
Analgesic use	5.6±1.9
Complications	
Seroma	8 (8)
Hematoma	6 (6)
Secondary hydrocele	6 (6)
Infection	2 (2)
Recurrence	0 (0)
Chronic pain	0 (0)
Mean hospital stay (hours)	47±13
Cost of treatment (INR)	5,981±1,285

[a]Chronic obstructive pulmonary disease.

Table 2: Reverse darning repair vs. Lichtenstein repair.

Parameters	Reverse darning repair (n=62)	Lichtenstein repair (n=42)	t value	P value
Mean age (years)	56.3±4	56±4	0.3	0.8*
Co-morbidities				
Diabetes	3	2	0	1#
Hypertension	6	5	0.1	0.7#
COPD[a]	6	5	0.1	0.7#
Clinical parameters				
Indirect hernia	35	24	0	0.9#
Direct hernia	27	18	0	0.9#
Mean duration of surgery (min)	15.7±1.7	31.2±2.5	37.4	<0.005*
Analgesic use (doses)	4.4±1.2	7.4±1.3	12.2	<0.005*
Mean hospital stay (hours)	39.4±8.2	58.1±9.5	10.7	<0.005*
Mean cost of treatment (INR)	5188±286	7154±1290	11.6	<0.005*
Complications				
Seroma	1	7	7.9	0.005#
Hematoma	0	6	9.4	0.002#
Secondary hydrocele	1	5	4.9	0.03#
Infection	0	2	3	0.08#
Recurrence	0	0	0	1#

[a]Chronic obstructive pulmonary disease; *Independent sample 't' test; #Chi-square test.

There was no difference between the reverse darning and Lichtenstein groups in terms of mean age, gender distribution, associated co-morbidities, types of hernia, surgical site infection, and recurrence rates. The Reverse Darning group was found to have significantly lesser mean duration of surgery (15.7±1.7 min. vs. 31.2±2.5 min.; t=37.4, p<0.005), analgesic use (4.4±1.2 doses vs. 7.4±1.3 doses; t=12.2, p<0.005), hospital stay (39.4±8.2 hours vs. 58.1±9.5 hours ; t=10.7, p<0.005), and cost of treatment (Rs. 5188±286 vs. Rs. 7154±1290; t=11.6, p<0.005) compared to the Lichtenstein group. The Reverse daring group was also better than Lichtenstein repair in terms of seroma formation (1 vs. 7; chi-square value=7.9; p=0.005), hematoma (0 vs. 6; chi-square value=9.4, p=0.002), and secondary hydrocele (1 vs. 5; chi-square value=4.9, p=0.03) (Table 2).

Figure 2: The darning phase of the reverse darning.

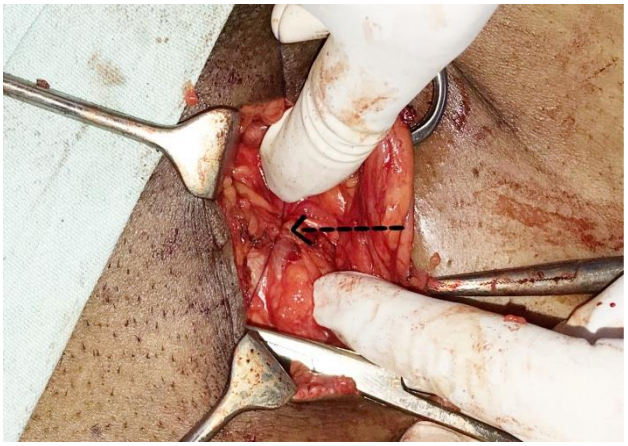

Figure 1: The first stitch through the pubic tubercle.

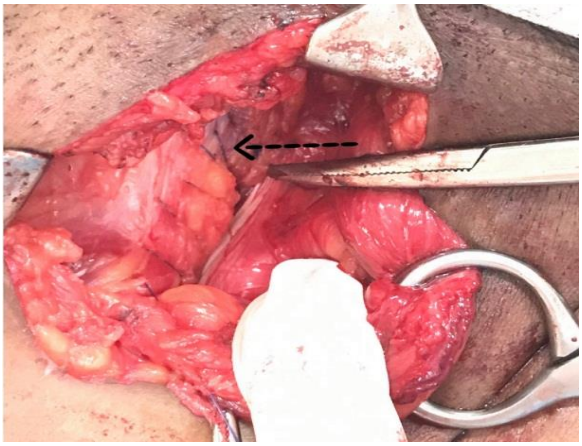

Figure 3: The reverse darning phase.

DISCUSSION

There are numerous methods of inguinal hernia repair which are broadly classified into prosthetic and tissue-based methods. The tissue based methods carry a risk of recurrence due to associated higher amount of tension. The description of the Lichtenstein tension free repair opened a new era in hernia repair. The method is very simple, effective and with minimal complications. So, it is currently the preferred method for inguinal hernia repair worldwide. But the people in the developing world may not be able to afford due to the cost of mesh. Hence, new techniques were developed. The darn repair, although tissue-based, has a tension-free posterior wall repair. Darn repair is a technique which use no mesh but gives a comparable results to mesh repair.[6]

Though the darn repair gave comparable results, there was a theoretical risk of recurrence. Hence we developed a new technique of reverse darning repair. Here, a non-absorbable suture (polypropylene) stitch was taken through pubic tubercle periosteum and recurring sutures were placed through conjoint tendon and the reflected part of inguinal ligament up to the deep ring. Then the suture was run backwards (reverse) on the same line with minimum bites up to the first stitch (Figures 1-3).

We found that the new technique of reverse darning was comparable to mesh repair in terms of recurrence and surgical site infection. It was also found that the reverse darning repair was superior to mesh repair in terms of duration of surgery (15.7±1.7 min. vs. 31.2±2.5 min.; t=37.4, p<0.005), analgesic use (4.4±1.2 doses vs. 7.4±1.3 doses; t=12.2, p<0.005), hospital stay (39.4±8.2 hours vs. 58.1±9.5 hours; t=10.7, p<0.005), and cost of treatment (Rs. 5188±286 vs. Rs. 7154±1290; t=11.6, p<0.005). The Reverse daring group was also better than Lichtenstein repair in terms of seroma formation (1 vs. 7; chi-square value=7.9; p=0.005), hematoma (0 vs. 6; chi-square value=9.4, p=0.002), and secondary hydrocele (1 vs. 5; chi-square value=4.9, p=0.03).

The mean operative time for reverse darn repair in our study was 15.7±1.7 min which was much shorter than darn repair performed by Kaynak et al (36.8 min), Kucuk et al (44.8 min), and Zeybek et al (48 min).[7-9] It implies that the reverse darn repair is faster compared to classic darn repair.

In our study, reverse darn repair, we had no recurrence, which was superior to Darn repair studies such as Kaynak et al (1%), Koukourou et al (4%), and Memon et al (7%).[7,10,11] We contribute the success of no recurrence to the tension free but competent repair in case of reverse darn repair.

The complication rate in the reverse darn repair was found to be 3% which was better than darn repair by Olasehinde et al (13%).[12] We had only one (1.6%) case of seroma in the reverse darn group compared to the darn repair by Kaynak et al (2%), Kucuk et al (1.7%), and Koukourou et al (4%).[7-9] We had a single case (1.6%) of secondary hydrocele in the reverse darn repair compared to the darn repair by Olasehinde et al (1.5%).[12] We had no case of wound hematoma in our reverse darn repair group compared to the published darn repair studies such as Kaynak et al (2.7%), Kucuk et al (1.1%), Zeybek et al (1.3%), Koukourou et al (14%), Memon et al (0%), and Olasehinde (23.5%).[7-12] The reduced incidence of seroma, hematoma, and secondary hydrocele in our repair is probably due to meticulous surgery and gentle tissue handling.

We had no case of wound infection in the reverse darn repair group compared to the darn repair by Kaynak et al (4%), Kucuk et al (5%), Zeybek et al (0.7%), Koukourou et al (2%), Memon et al (6%), and Olasehinde (3%).[7-12] The good tissue handling and a strict aseptic technique helped us achieve this feat.

The reverse darning technique has also got advantages in situations like a contaminated field, co-morbidites such as elderly and in low resource settings. The reverse darning seems to have an edge over the classical Lichtenstein's repair. In the light of above results, though the present study does show that the reverse darning repair has distinct advantages over the mesh repair. A larger study sample, randomized trial, and a longer follow up period may be needed before any further conclusions can be made.

CONCLUSION

Reverse darning is an effective and innovative technique to repair inguinal hernia. The simplicity, lesser cost, and lesser postoperative complications make this repair superior to standard Lichtenstein repair. The reverse darning repair is easy to replicate even in rural set ups with minimal resources.

ACKNOWLEDGEMENTS

We would like to thank our Head of Department Dr. E.J. Samuel for his constant encouragement and support to excel in all our endeavours.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Palanivelu C. Result of hand sutured laparoscopic hernioplasty: An effective method of repair. Indian J Surg. 2000;62(5):339–41.
2. Rutledge Robb H. Cooper's ligament repair: A 25 years' experience with a single technique for all groin hernias in adults. Br J Surg. 1998;103(l):1–10.

3. Callesen, Beck, Andersen Pain after primary hemiorrhaphy-Influence of Surgical technique. J Am Coll Surgery. 1999;188(4):385–9.
4. Lau H, Lee F. Determinant factors of pain after ambulatory inguinal herniorrhaphy: a multi-variate analysis. Hernia: J Hernias Abdominal Wall Surg. 2001;5(1):17–20.
5. Legutko J, Pach R, Solecki R, Matyja A, Kulig J. The history of treatment of groin hernia. Folia Med Cracov. 2008;49(1-2):57-74.
6. Finch DA, Misra VA, Hajibandeh S. Open darn repair vs open mesh repair of inguinal hernia: a systematic review and meta-analysis of randomised and non-randomised studies. Hernia. 2019.
7. Kaynak B, Celik F, Guner A, Guler K, Kaya MA, Celik M. Moloney darn repair versus Lichtenstein mesh hernioplasty for open inguinal hernia repair. Surg Today. 2007;37:958–60.
8. Kucuk HF, Sikar HE, Kurt N, Uzun H, Eser M, Tutal F, Tuncer Y. Lichtenstein or darn procedure in inguinal hernia repair: a prospective randomized comparative study. Hernia. 2010;14(4):357–60.
9. Zeybek N, Tas H, Peker Y, Yildiz F, Akdeniz A, Tufan T. Comparison of modified darn repair and Lichtenstein repair of primary inguinal hernias. J Surg Res. 2008;146(2):225–9.
10. Koukourou A, Lyon W, Rice J, Wattchow DA. Prospective randomized trial of polypropylene mesh compared with nylon darn in inguinal hernia repair. Br J Surg. 2001;88(7):931–4.
11. Memon GA, Shah SKA, Rehman H. An experience with mesh versus darn repair in inguinal hernias. Pak J Med Sci. 2017;33(3):699–702.
12. Olasehinde OO, Adisa AO, Agbakwuru EA, Etonyeaku AC, Kolawole OA, Mosanya AO. A 5-year Review of Darning Technique of Inguinal Hernia Repair. Niger J Surg. 2015;21(1):52-5.

Cite this article as: George R, Radhakrishna V, Mathew M, Rahman A, Thenamangalath A. Reverse darning technique: an effective and innovative method of inguinal hernia repair. Int Surg J 2019;6:2716-21.