Original Article

Management of Incisional Hernia – An Observational Study

Divyangi Sarvankar, Siddharth Jain, Sudhir Dube, Shruti Dube, Sandesh Gawade

Department of General Surgery, MIMER Medical College and BSTR Hospital, Talegaon D, Pune, Maharshtra, India

ABSTRACT

Background: With the increase in the number of abdominal operations, the number of incisional hernias has also increased considerably. This study was done to assess the magnitude of this problem, various factors leading to the development of this condition and to identify the best method for incisional hernia repair with the least recurrence rate. **Methodology:** This prospective study was conducted at a tertiary care hospital in Pune for 19 months. A total of 50 cases of incisional hernia were studied with follow-up period of 6 months. Patients were evaluated for risk factors causing an incisional hernia. All the cases were operated and the procedure adopted was an anatomical repair or mesh repair. The immediate post-operative complications and recurrence were recorded and analyzed. **Results:** Incisional hernia was seen in 6.8% of all hernias operated. It was found to occur more often in females in the 41–50 years age group (61%). Most of the cases (68%) presented with abdominal swelling with a previous history of gynecological surgeries (84%). The incisional hernia was common in the infraumbilical, region with a defect of 5-Scm in 68% of cases. Wound infection, obesity, multiparity, and respiratory diseases were the most common risk factors. No post-operative complications were noted with the anatomical repair. Seroma was the most common post-operative complication (9%) in the mesh repair group. There is no recurrence or mortality in the present study. **Conclusion:** If the defect is small, there is a place for anatomical repair in absence of predisposing factors such as obesity and bronchitis. Furthermore, onlay meshplasty is a safe and equally good method of incisional hernia repair with minor complications.

Key words: Anatomical repair, Incisional hernia, Mesh repair

INTRODUCTION

Incisional hernia is a perfect example of the old aphorism "an ounce of prevention is worth a pound of cure."[1] Ian Aird defines incisional hernia as a diffuse extrusion of peritoneum and abdominal contents through a weak scar of an operation or accidental wound.[2] Incisional hernia occurs in 5–11% of patients subjected to abdominal operations.[3] Multiple risk factors for incisional hernia have been identified, including obesity, advanced age, male sex, smoking, diabetes mellitus, malnutrition, malignancy, and steroid use.[4,5] These factors may contribute to delayed wound healing and decreased collagen synthesis.[6] Emergency surgeries, midline incisions, post-operative wound infection, and acute abdominal surgeries are associated with a higher incidence of incisional hernia development.[7,8] In post-operative wound infections, the proliferation of bacteria leads to decreased collagen synthesis and weakening of the

Access this article online	
Website: www.mmj.net.in	Quick Response Code
DOI: 10.15713/ins.mmj.73	

Address for correspondence:
Divyangi Sarvankar, Department of General Surgery, Department of General Surgery, MIMER Medical College and BSTR Hospital, Talegaon D, Pune, Maharshtra, India. E-mail: divyangi03@gmail.com

fascial closure which leads to early dehiscence and subsequent hernia formation.[9,10]

Rives, Flament, and Palot have clearly presented the pathophysiologic aspects of incisional hernia. Briefly, it is composed of: (1) a prerequisite background of systemic disorders; (2) damage to all regional parietal layers, mostly in hernias whose defect diameter exceeds l0 cm; (3) disturbance of ventilatory function, through impairment of the synergy between the abdominal wall and the diaphragm; and (4) several other visceral, vascular, and statodynamic disorders.[11,12] These complex situations have been given the name of "eventration disease" by Rives.[13]

For more than 100 years, attempts have been made to develop successful methods for repairing incisional hernia from anatomical repair to laparoscopic repair, but most attempts were followed by high incidence of recurrence. However, mesh repair techniques of hernia repair have revolutionized the treatment of incisional hernia with reduced number of post-operative complications and recurrence.[14]

The main objectives of incisional hernia repair surgery, as assessed by Chevrel and Flament and I.P. Palot, are the following: (1) closure of the parietal defect without excessive tension; (2) anatomic reattachment of the muscles through the tendon-like action of a mesh prosthesis; (3) normalization of the intra-abdominal pressure at the time of closure of the wrapping of the visceral sac or large premuscular overlays; and (4) the intraperitoneal placement of non-absorbable mesh is strongly contraindicated as potentially responsible for fibrosis or/and intraluminal migration.[15,16] However, procedures for the repair of these hernias with sutures and with mesh have been reported, but there is no consensus about which type of procedure is best. This study was done to assess the magnitude of this problem, various factors leading to development of this condition and to identify the best method for incisional hernia repair with least recurrence rate. Observations looked into were seroma formation, wound infection, mesh extrusion, hernia recurrence, etc.

Aims and Objectives

The aims of this study were as follows:

1. To study the age- and sex-related prevalence of incisional hernia
2. To identify the different causes and predisposing factors for incisional hernia
3. To study the complications of onlay mesh repair.

METHODOLOGY

This was a prospective study, conducted at the Department of General Surgery, Sasoon Hospital, from January 2016 to July 2017. Fifty patients of incisional hernia admitted in surgical wards, under all surgical units were included in this study. Approval was taken from the technical committee of surgery department and IEC. A detailed case history and clinical examination were carried out for each patient using a pro forma. Clinical diagnosis was established including the associated etiological, precipitating, and predisposing factors. All patients were analyzed in various aspects such as age, sex, risk factors, mode of presentation, previous operation, and site of previous scar. Patients were also evaluated for other risk factors such as obesity, diabetes, and malignant disease. Routine blood investigations, ultrasonography of abdomen along with chest X-ray, and ECG were done. Finally, decision was made for every case regarding the method of repair depending on the need of the case. Out of 50 cases, 45 underwent mesh repair, whereas the rest five cases underwent anatomical repair. The criteria for selection of mesh repair were wider defects, comorbid factors, and recurrence after anatomical repair.

For anatomical repair cases, layered closure was done. A scar excising elliptical skin incision was taken and the incision was deepened through the subcutaneous fat, until the peritoneum of the sac was encountered. Sac was opened, contents were reduced, and the redundant sac was excised. The abdominal defect was closed with continuous, non-absorbable suture, and a tension free repair was obtained. Any significant dead space in the subcutaneous fat was obliterated with absorbable suture followed by skin closure.

For mesh repair cases, onlay prolene meshplasty [Figure 1] was done. The abdomen was closed with Redivac drains. Foley's catheterization was done

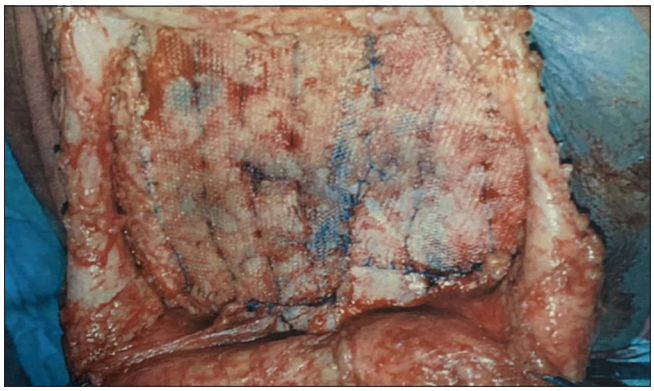


Figure 1: Prolene Mesh *in situ*

preoperatively to decompress the bladder throughout the operation and was removed on the 2nd day. Nasogastric aspiration was done for 24 h. Broad-spectrum antibiotics were given to the patient. The drains were removed on the 4th or 5th day. Sutures were removed on the 10th day. All cases were analyzed to find out the advantages of various operative techniques and their outcomes. The analyzed data were compared with other series in the literature and discussed.

RESULTS

Incidence of incisional hernia was 6.8% in our study.

Maximum number (38/50) of cases were of middle age group, that is, 20–50 years, youngest being of 21 years and eldest of 70 years. About 86% (43/50) were female [Graph 1].

About 40% of patients, in our study, were manual laborers. It is, generally, believed that severe straining and heavy lifting are more frequently associated with development of incisional hernia.

The most common symptom at presentation of incisional hernia was swelling (87%) and pain (37%). Swelling was visible on standing or exertion. The pain was intermittent, colicky.

Multiparity, obesity, and anemia were the most common predisposing factors for incisional hernia. Chronic bronchitis, asthma, and diabetes were least common [Table 1].

Out of 50, 45 cases had underwent a single surgical procedure before. Only four cases had history of two operations before developing incisional hernia.

A majority of 58% (29/50) underwent elective procedure. About 42% (21/50) underwent emergency procedure.

The most common surgical procedure after which incisional hernia developed was abdominal sterilization – tubectomy, followed by lower segment cesarean section and abdominal hysterectomy [Table 2]. There was a preponderance of infraumbilical midline incision. The gastrointestinal surgeries account for nearly 30%, which includes exploratory laparotomy for intestinal obstruction, duodenal perforation, gastrojejunostomy, vagotomy, and peritonitis. A majority of 76% (38/50) were operated under spinal anesthesia.

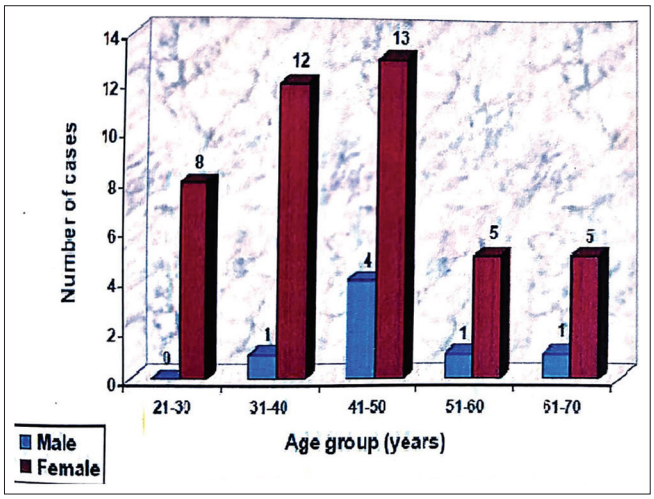
Among the predisposing factors (due to the previous operative procedure) for developing incisional hernia, wound infection was the most common.

In our study, 18% of incisional hernia occurred within a year of the previous operative procedure. Majority occurred within 5 years.

About 36% (18/50) cases were obese. Seventeen cases had poor abdominal tone, grading of which was done clinically. The patient with malgagnian bulge was considered to have poor muscle tone.

Majority of cases (34/50) had a defect size of 5–8 cm. Five patients had a defect size of 3 cm [Graph 2].

We observed no complications postoperatively, for anatomical repair in our study. In mesh repair group, four cases had seroma formation and three cases had wound infection [Table 3].



Graph 1: Bar chart showing age- and sex-wise incidence of incisional hernia

Table 1: Distribution of predisposing factors for Incisional Hernia

Findings	Number of cases	Percentage
Obesity	18	23
Multiparity	22	28
Anaemia	18	23
Diabetes	6	8
Asthma	5	6
Chronic bronchitis	2	4
Hypertension	7	8

Table 2: Surgical procedure after which Incisional Hernia developed

Procedure	Number	Percentage
Abdominal hysterectomy	13	26
Abdominal sterilization (Tubectomy)	15	30
Caesarean section	14	28
Acute intussusception	1	2
Duodenal perforation	4	8
Appendicular perforation	2	4
Epigastric hernia	1	2
Total	50	100

On 1 month follow-up, 45% had a healthy scar. Three cases had developed stitch abscess which was drained under local anesthesia. Only two cases developed stitch sinus, which healed after local exploration and removal of suture.

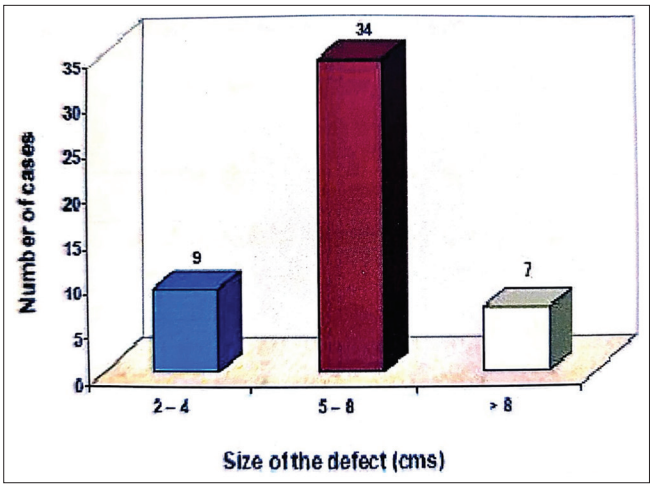
DISCUSSION

The techniques used for repairing incisional hernias, evolved in a practical, experiential way.

During the period of our study, 735 procedures were carried out for various types of abdominal hernias, out of which 6.8% were of incisonal hernia repair.

In our study, 76% of cases were from age group of 20–50 years. In a similar study conducted by Agrawal *et al*., 70% of cases were of same age group.[17]

Sex distribution in this study showed a female preponderance (F: M – 6.1:1). Millbourn *et al*. reported an incidence of 64.6% female population in their study of 383 patients.[18] The reason behind this could be laxity of the abdominal muscles due to multiple pregnancies and increased number of lower abdominal incisions in females.



Graph 2: Bar chart of distribution of cases as per size of defect of hernia

Table 3: Post-operative complications of Incisional Hernia Repair

Postoperative Complications	Number of cases	Percentage
Anatomical Repair		
Wound infection	0	0
Seroma	0	0
Postoperative cough	0	0
Distension of abdomen	0	0
Meshplasty		
Wound infection	3	7
Seroma	4	9
Postoperative cough	0	0
Distension of abdomen	1	2

The most common clinical presentation in the present study was swelling (87%) and pain (37%). Shankar *et al*., in his study, found that swelling was a symptom in 100% of the patients and 42.11% of the patients presented with pain.[19]

Incisional hernia occurred in midline infraumbilical incisions in 80% of the cases. This could be due to intra-abdominal hydrostatic pressure being higher in the lower abdomen when compared to upper abdomen in erect posture, absence of posterior rectus sheath below arcuate line, and most commonly used incisions in gynecological surgeries in females who have poor abdominal wall musculature.[20]

In the study by Bucknall *et al*., 42% of cases presented with hernia 1–5 years after primary surgery.[4] Similar observations were noted in the present study.

Common predisposing factors for incisional hernia in present study are multiparity (28%), obesity (23%), and anemia (23%). Most common post-operative complication of the previous surgery, predisposing the patient to incisional hernia, was wound infection (24%) followed by post-operative cough (16%).

To decrease local wound complications and hernia formation after laparotomy closure, fascial closure with a slowly absorbable monofilament suture (size 1 or 2) should be used. It should be closed in one layer in a continuous manner with self-locking anchor knots.[21] A suture-to-wound-length ratio of at least 4:1 is thought to be the minimum amount of suture needed to provide a strong closure and reduce hernia formation.[22] Closure should be accomplished with small fascial bites (5–8 mm). Excessive tension should be avoided. Obtaining the appropriate ratio and smaller fascial bites can more easily be done if a smaller suture and needle are used.[21]

Two recent randomized trials by Millbourn *et al*. and Deerenberg *et al*. comparing fascial closure using smaller bites (5–8 mm) to larger bites (10 mm) demonstrated decreased incisional hernias when smaller fascial bites were used.[18,23]

One study by Mayer *et al*. revealed that greater tension on the suture line increased the rate of wound infection compared with a lower suture line tension. It is thought that soft-tissue caught in a tight stitch can become ischemic, increasing the risk of a wound infection and future hernia formation.[24] It is generally recommended that the tissue be reapproximated but not strangulated.

A single-layer mass closure technique includes all layers of the abdominal wall except the skin. Experimental studies report a higher wound bursting strength and a lower rate of wound dehiscence when a mass closure is used compared with a layered closure.[4,25] Thus, if incisional hernia rates are to be decreased, education regarding current best practices of abdominal closure needs to be addressed. However, the use of prophylactic mesh in certain high risk patient populations is a reasonable consideration.[21]

In present study, 68% of cases had a defect size of 5–8 cm. The size of the fascial defect and the appearance of the fascia should dictate the selection of the most appropriate method of hernia repair. With prosthetic mesh, defects of any size can be repaired without tension. In addition, polypropylene mesh, by inducing an inflammatory response, sets up a scaffolding that, in turn, induces the synthesis of collagen.[26] In fact as per literature, underlay repair (i.e., preperitoneal placement of mesh) is better and has a lower recurrence than its counterpart, the onlay repair. It can be explained using Pascal's Law [Figure 2].[27]

Force = Area×Pressure

When the patient increases the intra-abdominal pressure while coughing or sneezing, this pressure is transmitted equally in all directions, and therefore, there will be divergent pressures on the edges of the repair, causing a high recurrence of incisional hernias after anatomical closure.

Application of Pascal's law[27] will allow us to understand the biomechanics of mesh placement of abdominal wall hernias. When there is a leak in a hot air balloon, it is best repaired by sealing the defect from inside. If sealed from the out, the pressure of the air or water will push the seal outwards and hence likely to fail. Now let us consider the following types of hernia repair.

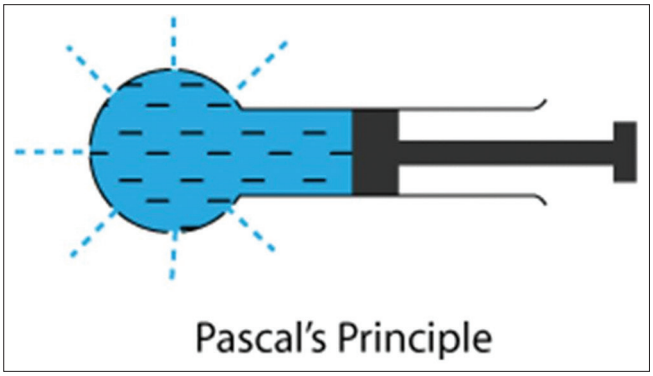


Figure 2: Experiment demonstrating Pascal's law

1. Anatomical closure
2. Onlay mesh
3. Inlay mesh.

When the patient increases the intra-abdominal pressure while coughing or sneezing, this pressure is transmitted equally in all the directions, and therefore, there will be divergent pressures on the edges of the repair, causing a high recurrence of incisional hernias after anatomical closure.

On the other hand, if an onlay mesh is placed superficial to the repair, then the forces of the intra-abdominal pressure act divergently on the wall and this is resisted by the presence of the mesh. However, though better than the former repair, there is still a propensity for failure as the forces are pushing the mesh outward. Here, success depends on how well the mesh is anchored to the fascial tissues. When the mesh is placed between the peritoneum and the abdominal wall, the intra-abdominal pressure forces are actually acting in favor of the repair and are compressing the mesh against the anterior abdominal wall. Anchoring the mesh securely is just academic. Thus, the recurrence is very low in intraperitoneal onlay mesh placements. It is also important that the mesh overlaps the edge of the defect by at least 3–5 cm to allow Pascal's forces to act evenly on the mesh [Figure 3].[27]

The use of prosthetic materials for incisional hernia repair has significantly lowered the reported recurrence rates but at the cost of its own complications. In the present study, no complications were noted in patients who underwent anatomical repair. Post-operative wound infection (7%), seroma (9%), and abdominal distension was noted in the prolene mesh repair group in the present study. At 1 month follow-up, stitch abscess was noted in 6% cases, which was drained under local anesthesia. With thorough patient evaluation, proper selection of operative technique, pre-operative patient preparation, use of suction drain and

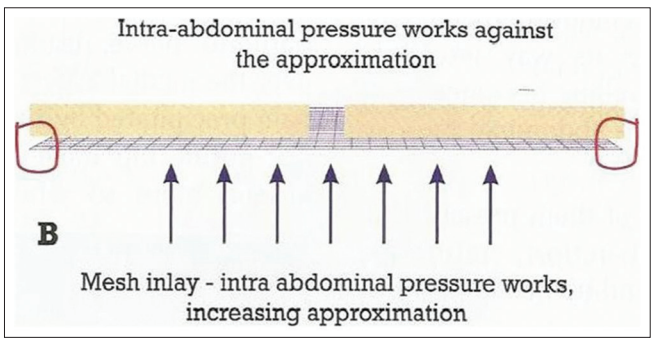


Figure 3: Mechanism of inlay mesh repair

perioperative broad-spectrum antibiotics, nasogastric aspiration, early ambulation, and the complication rates can be minimized. The goal of a successful repair is to minimize the recurrence rate with the lowest possible incidence of complications.[28]

There are few limitations of this study. First, we excluded incisional hernia, which needed emergency repairs, because they are associated with poor outcomes after the repair and, therefore, should be addressed separately. Second, we have not investigated post-operative pain and feeling of foreign body. Third, due to limitations in long-term follow-up of the patients in our study, the incidence of recurrence of incisional hernia could not be commented on.

CONCLUSION

Incisional hernia was found to occur more often in females of middle age group. For smaller defects (<3 cm), anatomical repair offered better results and less complications. For larger defects, we recommend meshplasty, to have a tension free repair, though few minor complications are expected.

REFERENCES

1. Kumar V, Rodrigues G, Ravi C, Kumar S. A comparative analysis on various techniques of incisional hernia repair-experience from a tertiary care teaching hospital in South India. Indian J Surg 2013;75:271-3.
2. Aird I. A Companion in Surgical Studies. 2nd ed. Edinburgh, London: Livingstone Ltd.; 1958. p. 659.
3. Abraham J, Elder S. Shoelace repair of large post operative ventral abdominal hernias: A simple extra peritoneal technique. Contempt Surg 1988;32:24.
4. Bucknall TE, Cox PJ, Ellis H. Burst abdomen and incisional hernia: A prospective study of 1129 major laparotomies. Br Med J (Clin Res Ed) 1982;284:931-3.
5. Hoer J, Lawong G, Klinge U, Schumpelick V. Factors influencing the development of incisional hernia. A retrospective study of 2,983 laparotomy patients over a period of 10 years. Chirurg. 2002;73:474-80.
6. Jorgensen LN, Sorensen LT, Kallehave F, Vange J, Gottrup F. Premenopausal women deposit more collagen than men during healing of an experimental wound. Surgery 2002;131:338-43.
7. Dai W, Chen Z, Zuo J, Tan J, Tan M, Yuan Y. Risk factors of postoperative complications after emergency repair of incarcerated groin hernia for adult patients: A retrospective cohort study. Hernia 2019;23:267-76.
8. Tubre DJ, Schroeder AD, Estes J, Eisenga J, Fitzgibbons RJ. Surgical site infection: The "Achilles Heel" of all types of abdominal wall hernia reconstruction. Hernia 2018;22:1003-13.
9. Carlson MA, Ludwig KA, Condon RE. Ventral hernia and other complications of 1,000 midline incisions. South Med J 1995;88:450-3.
10. Robson MC. Wound infection. A failure of wound healing caused by an imbalance of bacteria. Surg Clin North Am 1997;77:637-50.
11. Rives J, Pire LC, Flament JB, Convers G. Traitement des 6ventrations. Encycl Med Chir Paris 1977;4:40165.
12. Palot JP, Flament JB, Avisse C, Greffier D, Burde A. Use of prostheses in emergency surgery, retrospective study of 204 hernias. Chirurgie 1996;121:48-50.
13. Rives J, Lardennois B, Pire JC, Hibon J. Large incisional hernias, the importance of flail abdomen and of subsequent respiratory disorders. Chirurgie 1973;99:547-63.
14. Throckmorton TD. Tantalum gauze in the repair of hernias complicated by tissue deficiency; a preliminary report. Surgery 1948;23:32-46.
15. Chevrel JP, Flament JB. Traitement des Dventrations de la Paroi Abdominale. Encycl Med Chir Techniques Chirurgicales Appareil Digestif, Techniques; 1995. p. 40-165.
16. Stoppa R. Les Plasties de la Paroi Abdominale. Table Ronde du 756me Congr6s Frangais de Cbirurgie. Avec la Participation de RmBourgeon, Ph Detrie. In: Gautier-Benoit CI, Milhaud A, Neidhardt H, Poilleux J, Rives J, Visset J, editors. Masson, Paris: Actualit4s Chirurgicales; 1973. p. 662-736.
17. Agrawal M, Singh H, Sharma SP, Naveen S, Kaul RK, Chaudhary R. Prevalence, clinical presentation, and management of incisional hernia in the Indian population: A cross-sectional study. Int J Sci Stud 2016;4:51-4.
18. Millbourn D, Cengiz Y, Israelsson LA. Effect of stitch length on wound complications after closure of midline incisions, a randomized controlled trial. Arch Surg 2009;144:1056-9.
19. Shankar O. A comparative study of Incisional hernia: Open and laproscopic repair. Asian Pac J Health Sci 2015;2:105-13.
20. Jenna P, Srinivas PS. A clinical study and management of incisional hernia. J Evid Based Med Healthc 2017;4:3948-52.
21. Williams Z, Hope W. Abdominal wound closure: Current perspectives. Open Access Surg 2015;8:89-94.
22. Ceydeli A, Rucinski J, Wise L. Finding the best abdominal closure: An evidence-based review of the literature. Curr Surg 2005;62:220-5.
23. Deerenberg EB, Harlaar JJ, Steyerberg EW, Lont HE, van Doorn HC, Heisterkamp J, *et al*. Small bites versus large bites for closure of abdominal midline incisions (STITCH): A double-blind, multicentre, randomised controlled trial. Lancet 2015;386:1254-60.
24. Mayer AD, Ausobsky JR, Evans M, Pollock AV. Compression suture of the abdominal wall: A controlled

trial in 302 major laparotomies. Br J Surg 1981;68:632-4.
25. Nilsson T. Closure of the abdominal wound with single-layer and double-layer technique. Animal studies. Acta Chir Scand 1981;147:399-403.
26. Ronald W, A comparison of suture repair with mesh repair for incisional hernia. N Engl J Med 2000;343:392-8.
27. Rajkumar JS, Chopra P, Chintamani. Basic physics revisited for a surgeon. Indian J Surg 2015;77:169-75.
28. Leber GE, Garb JL. Long-term complications associated with prosthetic repair of incisional hernias. Arch Surg 1998;133:378-82.

How to cite: Sarvankar D, Jain S, Dube S, Dube S, Gawade S. Management of Incisional Hernia – An Observational Study. MIMER Med J 2022;6(1):5-11.

Source of Support: Nil. **Conflicts of Interest:** None declared.