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Comparative efficacy between open 3d mesh and conventional mesh in patients of inguinal hernia

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Abstract
Introduction: In this continuous evolving world, various newer techniques in the management of inguinal hernia coming up continuously. Introduction of 3D mesh is one of those recent advances in Inguinal Hernia Treatment. This study was designed to evaluate efficacy of the 3D mesh compared to the conventional mesh in open hernia surgery. It is a unique study with currently paucity of data available on it.
Methods: Sample size of 60. Patients were followed up at 7 days, 1 month, 3 months, 6 months and 1 year.
Results: The 3D mesh system as compared to conventional open surgical techniques has no recurrence, significantly lower duration of hospital stays, and no chronic pain.
Conclusion: We conclude that the efficacy of the use of the 3D mesh system definitely has advantages as compared to conventional open surgical techniques.

Keywords: 3D mesh, inguinal hernia

1. Introduction
The word hernia comes from the Latin for 'Rupture' and the Greek for 'Bud' [1]. Hernias of the groin comprise approximately 75% of all hernias and 95% are hernias of inguinal region. Inguinal hernias are 9 times more common in men. Over all inguinal hernia is the most common hernia in men [2]. Indirect hernias represent the most common type of hernia in both men and women. Direct hernias are more common in elderly. The most common presenting symptom for a groin hernia is a feeling of discomfort and dragging sensation in the groin region that is exacerbated by straining the abdominal musculature during lifting heavy objects, coughing, straining while passing urine or constipation. The treatment of all hernias, regardless of their location or type, is surgical repair. The approach to inguinal hernia can be open or laparoscopic. The introduction of biomaterials for inguinal hernia repair has become an integral component of hernia surgery. The advent of prosthetic materials has decreased the recurrence rate. Usher, in 1958 advocated the use of Marlex mesh [3]. The only exception when mesh is not used is the paediatric hernia or a contaminated surgical site. Polypropylene mesh - These are made of prolene fibres arranged in a network with pores of differing sizes. Polypropylene mesh is classified on the basis of density of the material and its surface area as heavyweight (90gm/sq. meter to 100gm/sq. metre); middle weight (45gm/sq. metre to 50gm/sq. metre) and light weight (less than 45gm/sq. metre).

Dr. Pajotin in 1998, proposed that a flat sheet of mesh may not be the ideal configuration for a laparoscopic repair [4]. He developed what he believed to be the ideal prosthetic, the three-dimensional mesh. The key benefits of 3D meshes he believed are: anatomically designed, easy positioning, fixation free and reduced pain.

2. Materials and Methods
2.1. The study was initiated after obtaining permission from the Institutional Ethics Committee.
2.2. Study Design: This was a prospective randomized study.
2.3. Study Site: This study was conducted in the Department of Surgery at Dr. DY Patil School of Medicine, Hospital and Research Centre, Nerul, Navi Mumbai.
2.4. Study Population: This prospective cohort study was conducted in patients with direct and indirect inguinal hernia who were going to undergo surgery at the study site from 2015 to 2017.
2.5. Study Duration: The study was conducted over a period of 2 years from 2015 to 2017.
2.6. Sample Size: 60patients were enrolled in the study. 30 patients in each cohort.

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The software used for Sample Size calculation was Epi Info Tools (2015).

2.7. Study Selection Criteria:

2.7.1. Inclusion Criteria
The patients satisfying the following criteria were enrolled into the study
1. All patients with direct and indirect inguinal hernia
2. Patients aged 18 years and above
3. Patients who were willing to give written informed consent and follow up.

2.7.2 Exclusion Criteria
The patients fulfilling any of the following criteria were excluded from the study
1. Patients less than 18 years of age.
2. Patients who were not willing to give written informed consent

3. Results
In the present study, post-operative assessment revealed the following findings. No adverse event was report in any patient in either of the 2 groups (p=1). Recurrence was noted in just 1 (1.33%) patient in the conventional group (p=1). The mean ± SD hospital stay in the conventional group was 3.27 ± 0.91 days as compared to 1.83 ± 0.53 days in the 3D mesh. A statistically significant difference ($p<0.0001$) was noted between the duration of mean hospital stay between the 2 groups. Only 1 (1.33%) patient in the conventional group had post-operative infection (p=1). In the conventional group, 14 (46.67%) patients had chronic pain as compared to none in the 3D mesh group. A statistically significant difference ($p<0.0001$) was noted between the presence of chronic pain between the 2 groups. Patient compliance was good in 28 (93.33%) patients in the conventional group, while in the 3D mesh group it was good in all 30 (100%) patients. There was no statistically significant difference (p=0.24576) between the patient compliance between the 2 groups. All patients in both the groups survived, i.e. there were no deaths in either of the groups.

Table 1: post-operative assessment

	Conventional open repair	3D mesh repair
Recurrence (%)	1.33	00
Mean hospital stay	3.27 ± 0.91	1.83 ± 0.53
Post-operative infection (%)	1.33	00
Chronic pain (%)	46.67	00

4. Discussion
In India, though the conventional mesh system remains the most frequently used, a greater proportion of patients are being treated with the 3D mesh. However, there is a dearth of literature on the use of 3D mesh and assessing its efficacy compared to conventional mesh. Therefore, this study was designed to assess and compare the efficacy of the 3D mesh with the conventional mesh system in managing hernia using the open surgical technique. In the current study, the 60 patients with inguinal hernia enrolled were divided and into the following two groups: [a] 30 patients that were treated using the conventional mesh and [b] 30 patients that were treated using the 3D mesh.

Inguinal hernia, the most common type of abdominal hernia, is more prevalent in males and the incidence tends to increase with age, gender and occupation. The goals of good hernia repair include minimizing intraoperative and postoperative complications, achieving effective repair, lowest possible recurrence, and early return to normal life, cost effectiveness and better cosmetic results. The introduction of biomaterials for inguinal hernia repair has become an integral component of hernia surgery. The advent of prosthetic materials has decreased the recurrence rate. The choice of the type of the mesh is often left to the surgeon's preference and cost factor. In various studies, it has been mentioned that choice of the prosthesis in hernia repair is far more important than technique as a determinant of outcome [5]. it is described that polypropylene meshes, cause some degree of contraction and scar formation in the long-term follow- up. In a systematic review of patients who had inguinal hernia repair, the use of a 3D mesh, as opposed to a conventional mesh, was associated with a lower incidence of chronic groin pain, groin stiffness, and foreign body sensations without any increased risk for hernia recurrence. The conventional mesh is typically placed in the anterior region, which shrinks and forms a scar plate that turns out to be a basis of constant irritation to the nerve resulting in pain [6]. An anatomically contoured 3D mesh for inguinal hernia repair often requires no fixation, with minimal risk of postoperative pain and less patient year recurrence rate. Recovery is excellent even with bilateral repair or some fixation [7]. In our study, no post-operative adverse event was reported in any patient in either of the 2 groups; like that observed by Amato G and colleagues [8, 9]. In the present study, recurrence was noted in 1 (1.33%) patient in the conventional group, while there was no recurrence among the patients treated with the 3D mesh. Our findings are in accordance with results observed in most similar studies. In a recent study by Brescia et al, no recurrence was seen in both, the 3D mesh as well as the Lichenstein group [10]. Paliwal et al reported no recurrence among any of their 260 study patients.[11] Amato G et al also reported no recurrence in both their studies [8, 9]. In our study, the mean ± SD hospital stay was higher (3.27 ± 0.91 days) in the conventional group as compared to the 3D mesh group (1.83 ± 0.53 days). A statistically significant difference ($p<0.0001$) was noted between the duration of mean hospital stay between the 2 groups. Amongst our study population, 1 (1.33%) patient in the conventional group had post-operative infection, as against none of the patients treated with the 3D mesh. No infections were reported by Amato G et al in both their studies [8, 9]. Chronic pain was reported in 14 (46.67%) patients in our conventional group, as compared to none patients in the 3D mesh group. A statistically significant difference ($p<0.0001$) was noted between post-operative chronic pain among the patients in the two groups. Brescia et al reported absence of chronic pain in both their groups [10]. No chronic pain in the 3D mesh groups was noted by Amato and colleagues in both their studies [8, 9].

All patients in both our groups survived, i.e. there were no deaths in either of the groups.

5. Conclusion
The predominance of inguinal hernia continues to remain in the male counterparts. Most of our patients reported a history of lifting heavy weights and indirect hernia. The findings of our study support the existing available literature regarding the efficacy of the use of the recent 3D mesh system as compared to

the conventional open surgical techniques. No recurrence was reported in patients treated with the 3D mesh. Significantly lower duration of hospital stays, and no chronic pain was observed in the 3D mesh group.

The use of three-dimensional mesh (3D mesh) for inguinal hernia repair is a safe and viable option. It offers many advantages in terms of less fixation time, shorter hospital stays, decreased chronic groin pain and decreased postoperative morbidity.

6. References

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