Research Paper

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Analysis of Various Method of Incisonal Hernia Repair Both Open and Laparoscopic

Medical Science

KEYWORDS : Incisional hernia, Laparoscopy, Mesh repair, Recurrence.

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ABSTRACT

Incisional hernia is defined as an abdominal hernia at the site of a previously made incision. AIMS & OBJECTIVE- To compare the operative outcome of the different methods of incisional hernia repair either difrent type of open or laparoscopic. MATERIAL & METHODS- Study was conducted in Department of surgery SRN Hospital, MLN Medical College, Allahabad, UP for 2yr period. RESULTS- A total of 29 patients were enrolled in the study and divided into three groups, of which 10 (34%) were males and 19 (66%) were females. Group A : Incisional hernia repair by Newer laparoscopic techniques Group B : Incisional hernia repair by laparoscopic hernia repair using pre-placed sutured mesh and tackers. Group C : Open method of incisional hernia repair. CONCLUSIONS- The new method of laparoscopic hernia also has a solution for the post operative redundant skin at the hernia site which was previously unaddressed. However, further study on a larger study population with a longer follow up is necessary to confirm the results of this study.

Introduction

A hernia is defined as protrusion of whole or a part of viscus through the wall that contains it.

INCISIONAL HERNIA

Definitions

Incisional hernia is defined as an abdominal hernia at the site of a previously made incision. A hernia is the protrusion of an internal organ through a defect in the wall of the anatomical cavity in which it lies. A ventral hernia is any hernia protruding through the abdominal wall. An incisional hernia is a hernia protruding through an operation scar.

Epidemiology

Incisional hernias accounts for 15-20% of all abdominal wall hernias.

Incisional hernias are twice as common in women as in men.

Incidence of incisional hernia is 2% to 30% following abdominal surgery

Incidence of incisional hernia after midline laparotomies range from 3-20% and doubles if there is surgical site infection.

Risk of incisional hernia is 10.5% for midline, 7.5% for transverse, and 2.5% for paramedian incisions.

Incisional hernia Recurrence rates are as high as 45% to 50%

Etiology/Risk Factors

Conditions causing impaired wound healing

Deep wound infections (most common), Age (>45yrs), Gender (Female > Male), Obesity (BMI>25), Ascites (protein deficiency), Malnutrition, Diabetes Mellitus, Renal failure, Collagen Metabolism Disorder, Anemia, Smoking, Chemotherapy, Steroids, Inflammatory bowel disease, Multiple laparotomies, Early wound dehiscence

Conditions causing raised intra abdominal pressure

Obesity (BMI>25), Ascites, Pregnancy, Chronic Obstructive Pulmonary Diseases, Sleep Apnea, Constipation, Prostatism.

Conditions associated with surgical techniques and peri operative care

Emergency operation, Recurrence procedure, Surgeon's procedure & skills, Suture technique, Suture Material, Type of prosthetic and its placement, Placement of drains, Wound infection, Early wound dehiscence

Pathophysiology

The cause of Incisional hernia is multi factorial as listed above. Following any incision or trauma to be the abdomen, the integrity of the complex system of abdominal wall is lost and this leads to loss of stability. When other additional factors like those which raise the intra-abdominal pressure and/or factors which cause an impairment in the wound healing process and/or factors associated with faulty surgical techniques & peri operative care are super added, the immature scar gives way and this leads to an incisional hernia at that site. As the hernia grows the chance of complications such as incarceration and strangulation of viscera, atrophy of subcutaneous tissue, thinning of skin, ulceration of skin, and loss of domain of the viscera occur. The lateral abdominal muscles retract and becomes fibrotic and this enlarges the defect. Rives referred to this as "eventeration disease."

CLINICAL FEATURES:

Swelling or fullness at hernia / scar site

Aching or dragging sensation/pain

Increases in size of swelling on increasing intra-abdominal pressure (valsalva ,coughing, exercise, straining) / standing

Pigmentation, ulceration of the skin over the scar

Painful enlargement of previous hernia, which cannot be manipulated through the fascial defect

Possible signs of intestinal obstruction (incarcerated hernia)

Systemic toxicity secondary to ischemic bowel

Respiratory dysfunction can occur due to Large Ventral wall defects which cause paradoxical respiratory abdominal motion.

Urinary Retention and Constipation can occur in loss of abdominal domain hernias due to stasis of splanchnic venous system and bowel edema.

DIAGNOSIS

(CLINICAL TESTS, SCORING SCALES, IMAGING STUDIES)

Subjects will be examined both in the standing and supine positions Cough impulse test , valsalva manoeuvre

Palpation for position, extent, edges of underlying fascial defect, consistency (doughy and granular in omentum and elastic in case of intestine, tense and tender in case of strangulation)

Percussion reveals a resonant note if the content is intestine or a dull note if the content is omentum.

Auscultation may reveal bowel sounds in case of intestine or bruits/murmurs in case of an aneurysm.

Ultrasonography may be required in small and barely palpable incisonal hernias and in obese patients to confirm the diagnosis and ascertain the plane of defect. It can also help in excluding differential diagnosis like lipoma, hematoma, aneurysms etc.

Computerised tomography and Magnetic resonance imaging may be required in complicated and large hernias, obese patients, to visualise the entire abdomen and relationships of various intra abdominal organs.

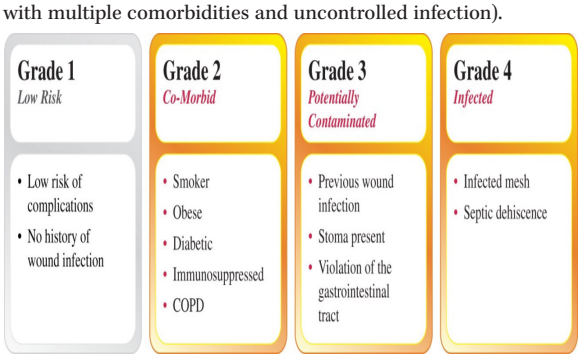
The Chevrel classification of incisional hernias based on site:

1. Medial or midline hernias:
Cranial: the xyphoid
Caudal: the pubic bone
Lateral: the lateral margin of the rectal sheath
Further classification from M1 to M5 going from the xiphoid to pubic bone was proposed
Therefore, define 5 M zones:
M1: subxiphoidal (from the xiphoid till 3 cm caudally)
M2: epigastric (from 3 cm below the xiphoid till 3 cm above the umbilicus)
M3: umbilical (from 3 cm above till 3 cm below the umbilicus)
M4: infraumbilical (from 3 cm below the umbilicus till 3 cm above the pubis)
M5: suprapubic (from pubic bone till 3 cm cranially).
Lateral hernias
The borders of the lateral area are defined as:
cranial: the costal margin
caudal: the inguinal region
medially: the lateral margin of the rectal sheath
laterally: the lumbar region.Thus, four L zones on each side are defined as:

L1: subcostal (between the costal margin and a horizontal line 3 cm above the umbilicus)
L2: flank (lateral to the rectal sheath in the area 3 cm above and below the umbilicus)
L3: iliac (between a horizontal line 3 cm below the umbilicus and the inguinal region)
L4: lumbar (latero-dorsal of the anterior axillary line)

Chevrel's classification based on width:
The width of the hernia defect was defined as the greatest horizontal distance in cm between the lateral margins of the hernia defect on both sides. In case of multiple hernia defects, the width is measured between the most laterally located margins of the most lateral defect on that side.

Grading of risk factor of incisional hernia: Ventral Hernia Working Group (VHWG) The novel grading system described herein is intended as a framework for the assessment of risk for SSO based on characteristics of individual patients and hernia defects. The system consists of 4grades & represent salient points along a continuum of risk from low risk (eg, healthy patients with uncomplicated wounds) to high-risk (eg, patients with multiple comorbidities and uncontrolled infection).



MATERIALS & METHODS:
The present study titled "ANALYSIS OF VARIOUS METHODS OF INCISIONAL HERNIA REPAIR BOTH OPEN AND LAPAROSCOPIC" was carried out in surgery department of M.L.N. Medical College, Allahabad, UP, India. from July 1, 2013 to June 30, 2015.

All the patients with history and clinical examination suggestive of incisional hernia attending surgical out patient department and those coming for follow up in outpatient department at regular intervals were considered for the study. After informing the patients about the study and taking a valid informed written consent the subjects were enrolled into the study. After successfully fulfilling the inclusion and exclusion criteria for the study, patients were randomised into one of the three treatment groups based on .....

Group A :
Incisional hernia repair by Newer laparoscopic techniques.

Patient under General Anesthesia is used to avail adequate abdominal wall relaxation.

On insufflation the incisional hernia tends to bulge out through the hernia opening (previous scar).

Margins of the peritonium covering the neck of hernia sac at the level of rectus on both sides is freshened up under laparoscopic vision. So that, with time the margins fuse with each other by the process of healing.

At the lateral border of rectus muscle, a port closure needle is passed out through the abdominal wall from inside to outside, and a non-absorbable prolene 2-0 suture is tagged and taken into the abdomen, passed from beneath the rectus muscle belly across to the other side of the opposite rectus muscle, intra-peritoneally.

The prolene 2-0 suture is then encircled around the lateral border of the opposite rectus and taken along the superior margin in the hernia sac, passed above the rectus to the other side, across the midline and removed out from the point where it was inserted.

Both ends of the thread are now brought out tightened to create a loose approximation of the rectus in midline & buried back. The process is repeated along the line of the defect, which brings both the recti together. The raw ends of the rectus approximate and bind together by process of healing.

A pre-tagged prolene mesh (Vipro7, Prosorb) is placed intraperitoneally, below the recti. Starting from the middle and then proceeding to the peripheral sutures, the sutures and mesh are secured in place.

So in this method we will be able to ensure two levels of reinforcement, one at the level of the mesh and the other at the level of the interrupted threads which approximate the recti.

How does the new method differ from the conventional methods?
Hernial sac is not opened
Restores better anatomical approximation therefore there is no risk of seroma formation, and other associated complications.
Lesser scar, which is cosmetically appealing
Better strength of reinforcement as it consists of two layers of closing
Due to this double layer method of closure there is lesser chances of recurrence compared to the previous methods.

Group B :
Incisional hernia repair by laparoscopic hernia repair using preplaced sutured mesh & tackers.

In this technique the defect is repaired posteriorly and no dissection within the scarred layer of anterior fascia is required.

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In cases of previously operated peritoneal cavity, into which port access is tough, a needle insufflation via the left upper quadrant, placing the port in the anterior axillary line to avoid injury to the spleen can be done.

Adhesiolysis is carefully done to get a 3-4cm circumferential overlap for the mesh beyond the defect. Sac is retracted and excised from within the hernia

Outline of the defect is then drawn on the abdominal wall skin and mesh is cut to fit this defect with an additional 3-4cm margin to provide adequate coverage and minimise tension. Non absorbable sutures are placed around the circumference of the mesh and tied, but not cut. The mesh is then rolled with the anterior surface lying inside and then passed into the peritoneal cavity through a 10-12mm port, unrolled inside and positioned. Small stab incision are placed on the skin on the borders marked before and the sutures placed on the mesh are brought out to the skin level and tied, and buried.

After all the sutures are secured, laparoscopic tacks are used to fasten the mesh to the anterior abdominal wall.

Group C :
Open methods of incisional hernia repair. Surgery is performed under General anesthesia. Incision is given over the previous scar and dissected down till the level of the anterior rectus. Defect is identified and fascia is cleared of the soft tissue attachments to allow a 3-4cm rim of healthy fascia circumferentially.

Hernial sac is identified and freed from the fascia to reduce the contents and prevent recurrence. At this stage it might be necessary to enter the peritoneal cavity to reduce the hernia. In defects whose diameter is lesser than 4cms, a primary repair can be performed. A margin of 3-4cms of the soft tissue is cleared to allow a healthy fascia, which is brought together in the midline and fixed with interrupted non absorbable sutures. Recurrence rates are as high as 30-50%

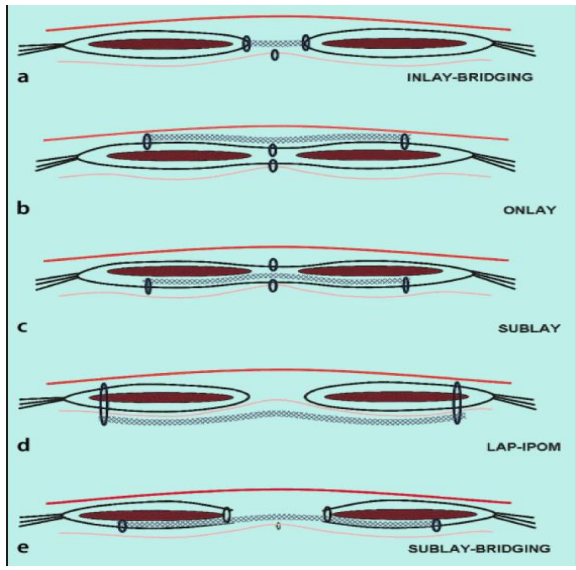
In larger defects a mesh repair is indicated. Depending on the position of the mesh placement, various techniques are described.

The onlay technique involves primary closure of the fascial defect and placement of mesh over the anterior fascia. The main advantage is that the mesh is not in direct contact with the underlying viscera, while the disadvantages are that being superficial its exposed to contamination and seroma formation. Risk of recurrence is about 28%.

In the in-lay technique the mesh is placed in between the fascial edges without overlapping. This is associated with a very high recurrence rate as the repair gives way when the underlying intra abdominal pressure rises.

In the sublay/underlay methods, mesh is placed below the fascial components. With a wide overlap the natural forces of the abdomen holds the mesh in place, preventing migration.

Retromuscular mesh placement technique was described by Stoppa originally and involves placing the mesh in the pre peritoneal space (retrorectus position). This space is dissected laterally to about 8-10cms beyond the defect. Mesh extends about 5-6 cms beyond the anterior and posterior borders of the defect. Smaller meshes need not be fixed and are held in place by the abdominal forces as per pascals law. In case of larger defects the mesh is secured laterally. Recurrence rate is 14%. Alternatively, mesh can be placed in the pre peritoneal space by incising the posterior rectus sheath 1cm medial to linea semilunaris. This space can be extended laterally upto the psoas muscle if necessary. Recurrence is 5%.



Component Seperation Technique: involves giving a relaxing incision 2cm lateral to the linea semilunaris on the lateral external oblique aponeurosis for several centimeteres from the costal margin above to the pubis below. External oblique is then bluntly dissected in the avascular plane. Additional release of posterior rectus sheath can be safely tried. This allows upto 20cm of mobilisation for midline approximation and closure. Recurrence rate is 20%.

Selection of cases
Group A : Incisional hernia repair by Newer laparoscopic techniques

Group B : Incisional hernia repair by laparoscopic hernia repair using pre-placed sutured mesh and tackers.

Group C : Open method of incisional hernia repair

INCLUSION CRITERIA
Symptomatic case of incisional hernia
Incisional hernia due to any cause at any site
Acceptable lab values
Must be able to understand & follow study related advices
Must be able to understand and give consent for the study
Questionnaire / clinical score

EXCLUSION CRITERIA
Serious life threatening medical illness
Conditions which in the view of the investigator might interfere with assessment, safety, results, outcomes of the study
Inability of the subject to understand and give consent
Participants who might not be able to comply with the study procedures till the end of the study
Hernias that could not be detected on physical examination.
Subjects with Ventral Hernia Working Group (VHWG) Grade 3 & 4 risk factors
Primary or umbilical hernia
Severe comorbid conditions likely to limit survival to less than 2 years.
Cirrhosis with or without ascites.
Bowel obstruction (partial or intermittent), strangulation.
Peritonitis, perforation, local or systemic infection, and need for emergency operation.

Observations:
A total of 29 patients were enrolled in the study and divided into

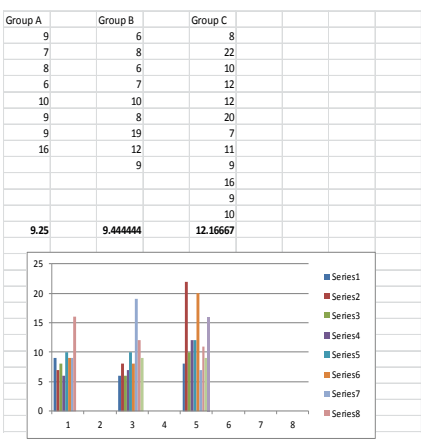
three groups, of which 10 (34%) were males and 19 (66%) were females.

After Randomisation
Group A had 3(37%) males and 5(63%) females.
Group B had 3 (33%) males and 6 (67%) females.
Group C had 4 (33%) males and 8 (67%) females.

Age distribution in various groups after randomisation was as follows

Age Group	Group A	Group B	Group C
0-20	0	0	0
21-40	6	7	6
41-60	2	2	4
61-80	0	0	2

The duration of hospital stay (in days) among various groups were as follows: The mean duration of hospital stay in Group A was 9.25 days (range 6-16 days), group B was 9.44 days (range 6-19 days), Group C was 12.16 days (7-22 days).

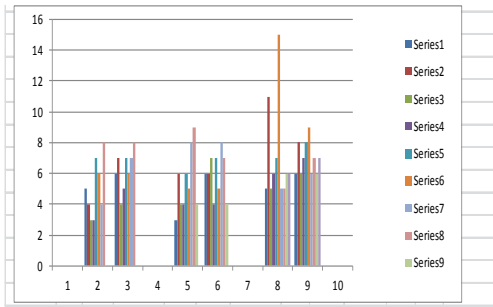


Group A	Group B	Group C
9	6	8
7	8	22
8	6	10
6	7	12
10	10	12
9	8	20
9	19	7
16	12	11
	9	9
		16
		9
		10
9.25	9.444444	12.16667

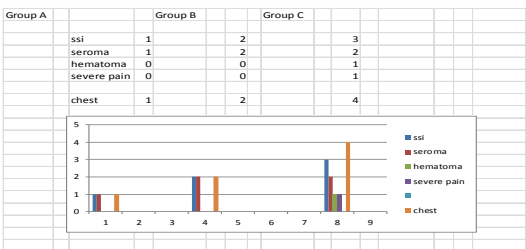
The duration of surgery in various study groups is as follows:
Subjects of Group A were operated upon in a mean of 96.87mins (range 65-130mins) while those of Group B were operated upon in a mean of 99.44mins (range 75-130mins) and those of Group C were operated upon in a mean of 85.14mins (range 45-120mins)

The duration and severity (max) of pain amongst the various subjects in the study groups were as follows:
Subjects of Group A reported pain lasting for a mean of 5 days (range 3-8days) duration and a mean severity of 6.25 (range 4-8days) on visual analog scale of 0-10, with 0 corresponding to no pain and 10 corresponding to severe pain. Subjects of Group B reported pain lasting for a mean of 5.44 days (range 3-9days) duration and a mean severity of 6 (range 4-8days). Subjects of Group C reported pain lasting for a mean of 7.25 days (range 5-15days) duration and a mean severity of 7.08 (range 6-9days).

Group A			Group B			Group C		
	5	6		3	6		5	6
	4	7		6	6		11	8
	3	4		4	7		5	6
	3	5		4	4		6	7
	7	7		6	7		7	8
	6	6		5	5		15	9
	4	7		8	8		5	6
	8	8		9	7		5	7
				4	4		6	6
							11	8
							5	7
							6	7
mean	5	6.25		5.444	6		7.25	7.083

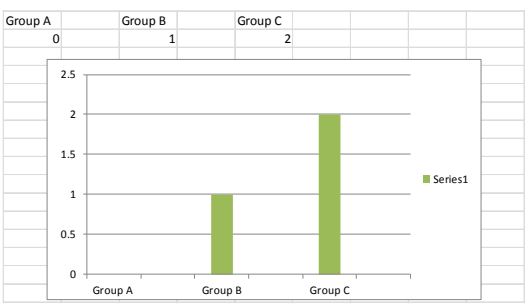


Post op complications (local and systemic) observed in the study groups are.



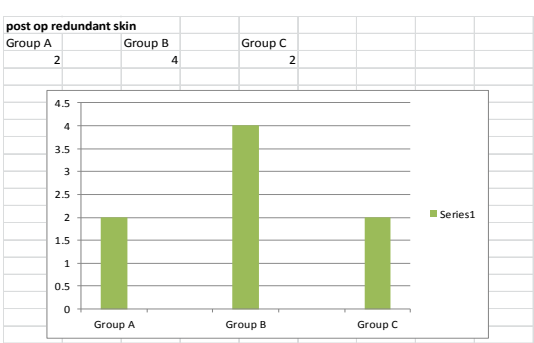
Group A		Group B		Group C	
ssi	1		2		3
seroma	1		2		2
hematoma	0		0		1
severe pain	0		0		1
chest	1		2		4

Post operative Incisional hernia recurrence:
A total of 3 subjects (10.34%) had recurrence in incisional hernia within one year of repair, of which 2 subjects had undergone open repair, one had undergone laparoscopic hernia repair using tacker and pre placed suture mesh.



Group A	Group B	Group C
0	1	2

Post op redundant skin: A total of 8 subjects (27.59%) had post operative redundant skin as a complication, of which 2 Subjects belonged to group A, 4 subjects belonged to group B, 2 subjects belong to group C.



post op redundant skin		
Group A	Group B	Group C
2	4	2

The cost of procedure and cost of post operative stay in healthcare facility incurred by subjects of various groups are as follows:

Subjects of Group A spent a mean of Rs 3775.00(range 2800-5800), and those of group B spent a mean of Rs4833.33 (range 3800-7700) , while those in Group C spent a mean of Rs 5566.66 (range 4100-9600) for incisional hernia repair.

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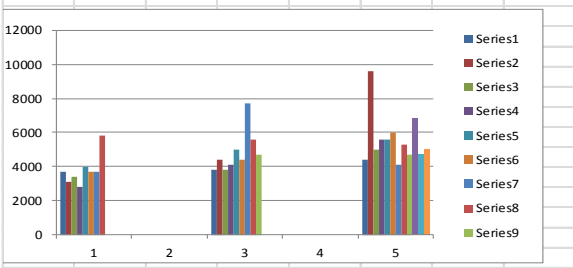
Si no	Group A	Group B	Group C
1	3700	3800	4400
2	3100	4400	9600
3	3400	3800	5000
4	2800	4100	5600
5	4000	5000	5600
6	3700	4400	6000
7	3700	7700	4100
8	5800	5600	5300
9		4700	4700
10			6800
11			4700
12			5000
Mean	3775	4833.333	5566.667



DISCUSSION:

The present study titled "ANALYSIS OF VARIOUS METHODS OF INCISIONAL HERNIA REPAIR BOTH OPEN AND LAPAROSCOPIC" was conducted in Swaroop Rani Nehru Hospital, Allahabad, India. Patients attending the outpatient department with history and clinical examination suggestive of incisional hernia were enrolled into the study after taking consent.

A total of 29 patients were enrolled in the study and divided into three groups, of which 10 (34%) were males and 19 (66%) were females.

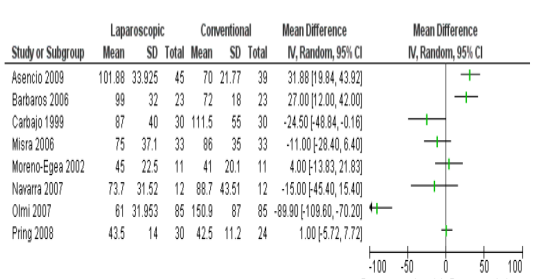
AGE SEX

The mean age of incidence of incisional hernia in our study population was 40.06yrs, almost 10-15 yrs before the figures in the west. This probably can be explained by the majority of our patients being females who have undergone a lower abdominal gynaecological procedure. The male: female ratio in our study was 1:1.94 which is in line with the findings of standard literature.

DURATION OF HOSPITAL STAY

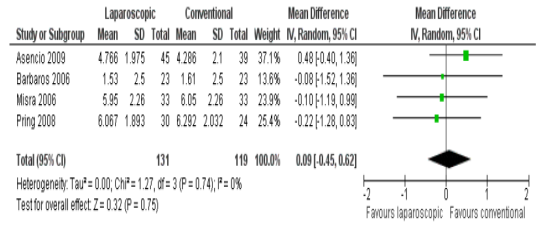
Subjects of Group A stayed in the hospital for a mean of 9.25 days (range 6-16 days), while subjects of Group B stayed for a mean of 9.44 days (range 6-19 days) and group C stayed for a mean of 12.16 days. (7-22 days). Groups A and B, both being laparoscopic procedures showed similar lengths of time. While the subjects in group C stayed a little longer owing to relatively prolonged period of pain and complications such as surgical site infections's and chest infections.

Figure 4. Forest plot of comparison: 1 Laparoscopic versus open repair (overall analysis), outcome: 1.2 Duration of surgery. (No pooling done because of heterogeneity)



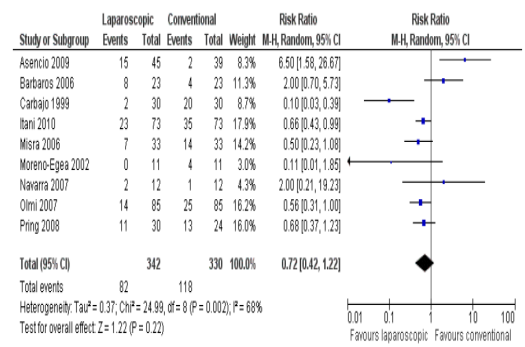
DURATION AND SEVERITY OF POST OP PAIN

Figure 10. Forest plot of comparison: 1 Laparoscopic versus open repair (overall analysis), outcome: 1.8 Acute pain (VAS or NRS data).



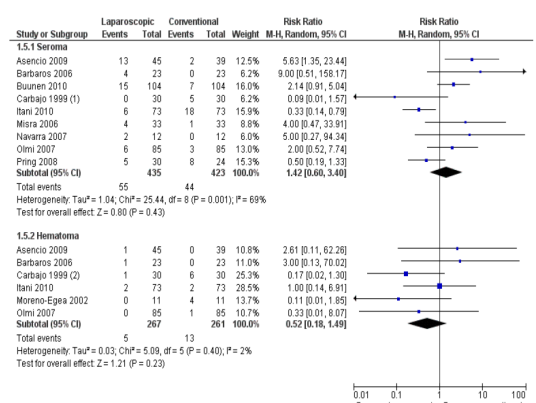
Subjects of Group A reported pain lasting for a mean of 5 days (range 3-8days) duration and a mean severity of 6.25 (range 4-8) on visual analog scale of 0-10, Subjects of Group B reported pain lasting for a mean of 5.44 days(range 3-9days) duration and a mean severity of 6(range 4-8). Subjects of Group C reported pain lasting for a mean of 7.25 days (range 5-15days) duration and a mean severity of 7.08 (range 6-9). None of the patients complained of chronic pain, the cut off for which is set as pain beyond three months by the International Association for the study of pain. Few Subjects in whom mesh was fixed with transfascial sutures complained of severe local pain, which was attributed to probable nerve entrapment or local inflammation, and was self limiting and did not require the need for local injection of anesthetic agents or steroids nor suture removal.

Figure 5. Forest plot of comparison: 1 Laparoscopic versus open repair (overall analysis), outcome: 1.3 Any complication.



INTRA OP AND POST OP COMPLICATION

Figure 7. Forest plot of comparison: 1 Laparoscopic versus open repair (overall analysis), outcome: 1.5 Local seroma or hematoma.

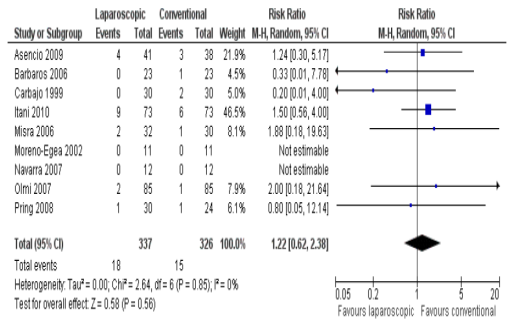


More number of Complications were seen in the open group than the laparoscopic groups owing to smaller incisions and lesser contamination In Group A, 3(37.5%) out of 8 subjects experienced complications, which included 1 ssi, 1 seroma, and 1

chest infection. While 6 (66.66%) out of 9 subjects in group B experienced minor complications like ssi in 2 subjects, seromas in 2 subjects and chest infections in two subjects. Subjects belonging to open group C experienced comparatively higher rate of complications in terms of 3 subjects having ssi's, 2 of them had seromas, 1 subject experienced an hematoma and one subject complained of severe pain at the mesh site and 4 chest infections. Overall no major complications were noted and no mortalities occurred.

RECURRENCE RATES:

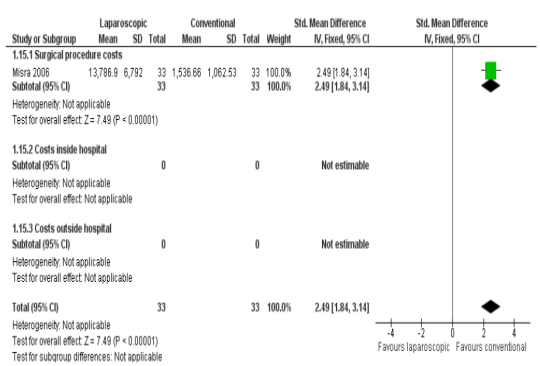
Figure 3. Forest plot of comparison: 1 Laparoscopic versus open repair (overall analysis), outcome: 1.1 Hernia recurrence.



In Group C, 2 out of 12 subjects experienced recurrences, while in group B, 1 out of 9 subjects experienced a recurrence and there were no recurrences noted in Group A. No recurrence in Group A is expected to be due to the near anatomical approximation of the rectus muscles and hence restoring the normal abdominal wall physiology. It could also be due to the short duration of the study, which was one year, as against the recommended minimum of three years. Small sample size could be another limiting factor which could have lead to falsely low recurrence rate in the new methodology group.

Cost

Figure 18. Forest plot of comparison: 1 Laparoscopic versus open repair (overall analysis), outcome: 1.14 Costs of therapy.



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Subjects of Group A spent a mean of Rs 3775.00(range 2800-5800), and those of group B spent a mean of Rs4833.33 (range 3800-7700) , while those in Group C spent a mean of Rs 5566.66 (range 4100-9600) for incisional hernia repair.

Conclusion:

Laparoscopic methods are evolving with promising results in the management of incisional hernia and are showing better results than open methods in terms of fewer complications, lesser duration and severity of post operative pain, lesser length of hospital stay, which along with fewer complications translates to lesser cost, fewer recurrences, and the new method of laparoscopic hernia also has a solution for the post operative redundant skin at the hernia site which was previously unaddressed. However, further study on a larger study population with a longer follow up is necessary to confirm the results of this study.

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