

ORIGINAL ARTICLE

CLOSURE OF ELECTIVE ABDOMINAL INCISIONS WITH MONOFILAMENT, NON-ABSORBABLE SUTURE MATERIAL VERSUS POLYFILAMENT ABSORBABLE SUTURE MATERIAL

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Background: Closure of abdominal incisions with different suture materials has been a matter of great controversy. Polypropylene and Polylactide with Polyglycolide are among the commonest suture materials used for closure of abdominal incisions. Objectives of this study were to assess optimal suture material used for closure of elective abdominal incisions and to see complications associated with these suture materials. **Methods:** This prospective, comparative, randomised study was conducted at public and private sector hospitals of Nawabshah and Hyderabad from 1st Jan 2005 to 31st October 2009. All patients who underwent abdominal surgery under the investigators' supervision were included in the study. Patients were divided into 2 groups on even or odd numbers. In group-A patients' incision was closed with monofilament, non-absorbable Polypropylene (Prolene) No. 1 suture material and in group-B incision was closed with Polyfilament, absorbable, co-polymer of Polylactide with Polyglycolide (Vicryle) No. 1. **Results:** A total 274 patients were finally analysed for closure of elective abdominal incisions, with 138 (50.4%) patients in Group-A and 136 (49.6%) patients in Group-B. Vicryle was found superior in knot security and suture handling. Superficial wound infection was found in 5.79% patients of Group-A and 6.61% of Group-B. Discharging sinus was found in 3.62% of Group-A vs 0.73% of Group-B. Burst abdomen was seen in 2.17% patients in Group-A and 1.47% in Group-B. Incisional hernia was present in 4.34% of Group-A and 0.73% patients of Group-B. No patient in Group-B developed persistent pain at incisional site while it was found in 8.69% patients of Group-A. **Conclusion:** Polylactide is an optimal suture material in closure of elective abdominal incisions. **Keywords:** elective, incisions, monofilament, polyfilament, suture, postoperative, complications

INTRODUCTION

Approximately 700,000 open abdominal procedures are performed annually in Germany and 4,000,000 in United States.¹ After abdominal incisions, patient's skin has always to be closed separately, either at the time of operation or at a few days later. There are two other layers to be closed, i.e., peritoneum, which is attached to posterior rectus sheath in case of midline incisions or inner muscular layers in case of lateral incisions, and anterior rectus sheath in case of midline wound or muscular layers in laterally placed incisions.^{2,3} These layers are usually closed in two-layers with the skin as second layer. However, they can also be closed in classical three layers, i.e., peritoneum as first layer; muscles, rectus sheath or linea alba as second layer, and skin as third layer.^{4,5}

Different types of suture materials are used for closure of abdominal incisions. There has been continuous debate on results of monofilament (polypropylene) with polyfilament (co-polymer of polyglycolide and polylactide) suture materials.

In prospective studies, the incidence of incisional hernia varies from 9%–20%. Wound infection, obesity, suture closure technique is mentioned as major risk factors for the development of incisional hernia. Whereas patients related factors such as, age, gender, body mass index, underlying disease or co-morbid

illness, prior surgical procedures and life style factors (e.g., smoking) cannot be controlled or standardised, the decisive chance to lower the incidence of complications, especially incisional hernia is to optimise the surgical technique. Therefore, great variety of suture materials and needles has been developed to provide an adequate closure of the fascia and thus the abdominal wall.⁵⁻⁸ Due to these facts closure of abdominal incisions is still a matter of great debate. Despite advances in surgical techniques and materials, abdominal fascia closure has remained a procedure that often reflects a surgeon's personal preference with reliance on tradition and anecdotal experience.^{9,10}

Many studies have been done to see different postoperative complications with each of these suture materials, but none of these have been able to determine the definite superiority of one technique of abdominal wall closure with monofilament or polyfilament.

Our primary object was to compare postoperative wound complications associated with each of these suture materials. We also assessed suture handling properties and knot securities.

MATERIAL AND METHODS

This prospective, comparative randomised study was conducted at public and private sector hospitals of Nawabshah and Hyderabad from 1st Jan 2005 to 31st Oct 2009. During this period all patients of either sex

above the age of 13 years having elective abdominal surgery under authors' supervision were included in the study. Patients below the age of 13 years, having serious co-morbid illness like ischemic heart disease, severe chronic obstructive airway disease, and chronic liver disease were excluded. Patients who presented in acute illness and were found to have peritonitis or having gross visceral infection were also excluded. Patients who lost to follow-up were excluded.

These patients were divided into 2 groups according to odd or even numbers. In Group-A patients' abdominal incision was closed with monofilament, non-absorbable polypropylene (Prolene) suture No. 1 and in patients of Group-B, the abdominal wall was closed with polyfilament, absorbable, co-polymer of polyglycolide with Polylactide (Vicryle) No. 1.

The patients were admitted in ward. Detailed history was taken and thorough examination was performed with special focus on variables like anaemia, jaundice, weight, general health, any previous scar on abdomen. Investigations were performed to establish diagnosis and to assess general fitness. Complete blood count, blood sugar, blood urea and where required ECG and chest X-ray were done. In addition ultrasound abdomen, CT scan, intravenous urography, gastroduodenoscopy, or contrast studies of gut were performed when indicated. Informed written consent was obtained.

Similar antibiotic prophylaxis was used in both groups at the time of induction of anaesthesia and switched to oral antibiotics once oral feeding was tolerated. In all patients except of flank incisions, wound was closed in 2 layers, with the skin being the 2nd layer. In cases of flank incision wound was closed in 3 layers with muscles in 2 layers and the skin as the 3rd layer.

During closure of incision properties of suture material like handling properties and knot security were assessed. Postoperatively Incision was examined usually on 5th postoperative day. However it was seen earlier in cases when dressing became soaked or patient developed fever or tachycardia and no other source of fever or tachycardia was found. Patients were discharged from hospital once oral feeding was tolerated well and patients became freely mobile. Skin stitches were removed on 9th postoperative day in outpatient clinics. In patients who underwent midline incisions and were obese, chronic smokers or chronically constipated abdominal belts were advised for 3 months postoperatively. Follow-up visits were advised at 1, 3 and 6 months. Postoperatively these patients were assessed for complications related to abdominal incision.

Patients' data was recorded on a pre-designed Performa. All data were analysed for categorical and

continuous variables like age, sex, properties of suture materials, and postoperative wound complications especially in relation to type of suture material used for closure of abdominal wall. Statistical tests were applied and *p*-value was calculated using SPSS-11.

RESULTS

A total of 274 patients were finally analysed in this study, with 138 (50.4%) patients in Group A and 136 (49.6%) patients in Group-B. Mean age of both groups of patients was 42.43±14.09 years (13–76 years). Male patients were 117 (42.7%) and female were 157 (57.3%). Mean weight was 59.97±13.32 Kg (29–98 Kg). Regarding pathology, kidneys and upper ureters were involved in 96 (35%) patients, gall bladder and common bile duct disease in 91 (33.2%) patients, urinary bladder, prostate, and lower ureters in 27 (9.9%) patients, small and large bowel pathology in 23 (8.4%) patients, ovarian mass or cyst in 15 (5.5%) patients, uterine pathology in 10 (3.6%) patients, retro-peritoneal mass in 5 (1.8%) patients, stomach pathology in 4 (1.5%) patients, and lower part of oesophagus in 3 (1.1%) patients (Table-1).

Co-morbid illness was found in 68 (24.8%) patients. Amongst them, 27 (39.70%) patients developed postoperative wound complications. It included 12 (17.14%) patients of diabetes mellitus, 8 (11.76%) patients of hypertension, 5 (7.35%) patients of bronchial asthma and 1 (1.47%) patient each of ischemic heart disease and miscellaneous group.

Flank incision was the most common incision that was made in 96 (35%) patients, followed by right sub-costal incisions in 91 (33.2%) patients. Lower midline incision was made in 52 (19%) patients, conventional midline incision in 28 (10.2%) patients, and upper midline incision in 7 (2.6%) patients (Table-2).

All incisions were closely observed during the postoperative hospital course and at outpatient clinics on follow-up visits at 1, 3 and 6 months. Any wound complication was noted. Thirty-four (24.63%) patients in the monofilament group and 13 (9.55%) patients in the polyfilament group developed wound complications. Seventeen (6.20%) patients developed superficial wound infection, including 9 (6.61%) patients of polyfilament group and 8 (5.79%) patients of monofilament group. Six (2.18%) patients developed discharging sinus that included 5 (3.62%) patients of monofilament group and 1 (0.73%) patient of polyfilament group. Burst abdomen was seen in 5 (1.82%) patients, 3 (2.17%) patients of monofilament group and 2 (1.47%) patients of polyfilament group. Incisional hernia developed in 7 (2.55%) patients including 6 (4.34%) patients of monofilament group and 1 (0.73%) patients of polyfilament group. Persistent pain was present only in monofilament group in 12 (8.69%) patients (Table-3).

Table-1: Pattern of visceral pathology in patients

Pathology	Number (%)
Kidneys and Upper Ureter	96 (35)
Gall Bladder & Common Bile Duct	91 (33.2)
Urinary Bladder, Prostate, and Lower Ureter	27 (9.9)
Small and Large Bowel	23 (8.4)
Ovarian Mass or Cyst	15 (5.5)
Uterine Pathology	10 (3.6)
Retropertitoneal Mass	5 (1.8)
Stomach Pathology	4 (1.5)
Pathology of Lower part of Oesophagus	3 (1.1)

Table-2: Type of incisions used in the study

Type of Incision	Number (%)
Flank Incision	96 (35)
Right Sub-costal Incision	91 (33.2)
Lower midline Incision	52 (19)
Conventional Midline Incision	28 (10.2)
Upper Midline Incision	7 (2.6)

Table-3: Comparative analysis of postoperative wound complications with monofilament and polyfilament suture materials (n=274)

Postoperative wound complications	Suture Materials			p
	Monofilament (n=138)	Polyfilament (n=136)	Total	
Nil	104 (75.36%)	123 (90.4%)	227 (82.8%)	0.001
Superficial Wound Infections	8 (5.79%)	9 (6.61%)	17 (6.20%)	
Discharging Sinus	5 (3.62%)	1 (0.73%)	6 (2.18%)	
Burst Abdomen	3 (2.17%)	2 (1.47%)	5 (1.82%)	
Incisional Hernia	6 (4.34%)	1 (0.73%)	7 (2.55%)	
Persistent Pain	12 (8.69%)	0	12 (4.37%)	
Total	34 (24.63%)	13 (9.55%)	47 (17.15%)	

DISCUSSION

Although there are substantial number of randomised studies and several meta-analysis examining different techniques of abdominal fascia closure the optimal and better method of closing the abdomen has not yet been found.^{6,7,11} Therefore the technique and material for abdominal fascia closure are still determined by local material supply and surgical traditions. Regarding optimal method of abdominal closure a variety of factors have to be considered like wound infection, wound dehiscence, incisional hernia, suture sinus, and pain.¹²

Most common complication noted in this study was superficial wound infection which is the only complication found slightly more in patients of polyglycolide group. Polyglycolide is a braided, material having half life of 20–30 days and chances of infection is more in this group of patients as harbouring organisms is more in this types of suture material than monofilament suture materials.¹³ Choudhary *et al*¹² demonstrated wound infection in 22.5% patients of monofilament mass closure of abdominal incisions. They found sinus formation in 2% patients of monofilament group, while in our study it was found in 3.62% patients of monofilament group and in only 0.73% patients of polyfilament group.

The meta-analysis by Hodgson *et al*¹⁴ reported less incisional hernias after closure with continuous non-absorbable sutures but also found significantly more suture sinuses and wound pain requiring further interventions.

Our study demonstrated burst abdomen in 2.17% patients of prolene group and 1.47% patients of polyfilament group. In a study by Gys *et al*¹⁵ found burst abdomen in 3% patients of prolene group and 1.9% patients of polyglycolide group.

In our series incidence of incisional hernia was significantly more common in monofilament group, i.e., in 4.34% patients while it was found only in 0.73% patients of polyglycolide group. Gys *et al*¹⁵ found incisional hernia in 6% patients of each group.

Persistent pain at either end of wound was found only in monofilament group in which it was found in 8.69% patients, which may be due to the knot present at these sites.

CONCLUSION

Vicryle is an optimal suture material for closure of elective abdominal incisions. Complications like burst abdomen, discharging sinus, incisional hernia, and persistent pain are more common with Prolene. Properties of suture handling and knot security are also superior with Vicryle. Superficial wound infection is found slightly more in the Vicryle group.

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