TYPES OF SUTURING AND THEIR CLINICAL OUTCOME IN OPERATED PATIENTS IN A RURAL TERTIARY CARE SETUP

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ABSTRACT

Introduction: The present study was aimed at different modalities of abdominal skin suturing techniques and their outcome in various abdominal skin incisions. **Material and methods:** All the patients above the age of 18 years irrespective of gender who were undergoing abdominal surgeries and getting sutured by either Simple, mattress, subcuticular or tension sutures were included in the study. The demography, diagnosis, type of wound & suture and its outcome was followed till day 14. **Results:** A total of 120 randomly selected cases with different abdominal incisions and different suturing techniques associated with co-morbid factors were selected. Majority of cases i.e, 40 (33.3%) belonged to inguinal hernia, followed by appendicitis, intestinal perforation, intestinal obstruction. Age of 61 to 70 was the most common age group. Most of the cases had clean wound (59) followed by clean contaminated (27) and contaminated wounds (28). The types of sutures observed were simple, mattress, subcuticular and tension, which were done in 30, 24, 30 and 31 patients respectively. Among these the least complications were seen with subcuticular followed by simple type of sutures. The groups of the types of suture used were not comparable due to difference in the type of wound and disease in the patients. **Conclusion:** Although every type of suture has its own advantages, disadvantage, indications and contraindications, simple and subcuticular sutures have better outcome as compared to other forms of suture.

Key words: Abdominal incisions, Clinical outcomes, Suturing techniques

INTRODUCTION

Suture is a generic term for all materials used to bring served body tissue together and to hold these tissues in their normal position until healing takes place. Sutures which are used in surgical purpose for field of medical textiles is now a most demand in joining of different type of tissues. Sutures are used to re-approximate the divided tissues and ligation of the cut end vessels. If the suture fails to perform the above said functions, the consequences may be disastrous. Massive bleeding may occur when the suture loop surrounding a vessel is disrupted [1][1].

Securing wounds is possible by knot or by recently developed barbed suture. Sutures require knots so as to ensure optimal tissue closure strength. The goal of wound closure is to bring the edges of the wound together not only with sufficient strength to prevent dehiscence, but also with a minimal residual tension and compression of the tissue [2].

With the first wave of bioactive sutures already in the marketplace, research is ongoing in the development of future products. Such sutures could potentially have not only antimicrobial activity but also anaesthetic and anti-neoplastic functions. Some clinical trials have already been completed in Russia. This technology is likely to become commonplace [3].

The desired characteristics of suture materials are Easy to handle, Predictable behaviour in tissues, Predictable tensile strength, Sterile, Glides through tissues easily, Secure knotting ability, Inexpensive, Minimal tissue reaction, Non-capillary, Non-allergenic, Non-carcinogenic, Non-electrolytic, Non-shrinkage [4]. The present study was due to paucity in the studies done in Indian setting on various technique of abdominal suturing. Also, outcome of the study would help in decreasing the post operative Complications and hospital stay of the patient.

Aims and Objectives: To study the different modalities of abdominal skin suturing techniques and their outcome in various abdominal skin incisions operated in Department of Surgery, Pravara Rural Hospital, Loni.

MATERIALS AND METHODS

Study design: Descriptive study

Ethics approval: After receiving approval of ethics committee and written consent from was obtained from the participants

Study period and location: The study was conducted

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on patients admitted in Department of Surgery, Pravara Rural Hospital from September 2015 to September 2017.

Sample size: A total of 120 cases undergoing abdominal surgeries in surgery department were included in the study.

Samples selection: The patients satisfying inclusion and exclusion criteria were included in the study.

Inclusion criteria: All the patients above the age of 18 years irrespective of gender who were undergoing abdominal surgeries in Our rural hospital and getting sutured by either simple, mattress, subcuticular or tension sutures, and giving written informed consent for inclusion in the study, were included in the study.

Exclusion criteria: Patients undergoing Gynaecological, obstetric, laproscopic, paediatric, burns or plastic surgeries were excluded from the study.

Methodology

Following details of participants were recorded: name, age, gender, date of admission, name of the surgery, type of incision taken, post operative findings, date of suture removal and presence of co-morbidities like diabetes mellitus, hypertension, hypoproteinaemia.

Whenever necessary, pus was sent for culture to see for the sensitivity of the organisms to antibiotics. Pre operative shaving was done and skin was prepared with betadine and spirit. Post operatively wounds were examined for any signs of infection, wound dehiscence, etc. from day 3 to the day of suture removal.

Four groups were made, one for each type of abdominal skin suturing technique i.e simple sutures, mattress sutures, tension sutures and subcuticular sutures. Cases were selected randomly for the study.

RESULTS

A total of 120 randomly selected cases with different abdominal incisions and different suturing techniques associated with co-morbid factors were selected. These cases have been observed from post operative day 1 to 14 for any normal or abnormal changes, and the findings were noted. The study was conducted on 4 types of suturing techniques namely simple suture, mattress sutures, tension sutures, subcuticular sutures on different abdominal incisions for different cases. In each of these groups, 30 cases were included. The number of emergency cases were 54 out of 120 (45%) and remaining 66 cases were elective (55%).

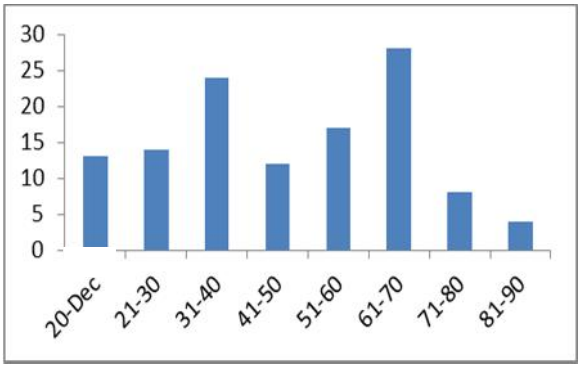

Figure 1: Age wise distribution of cases

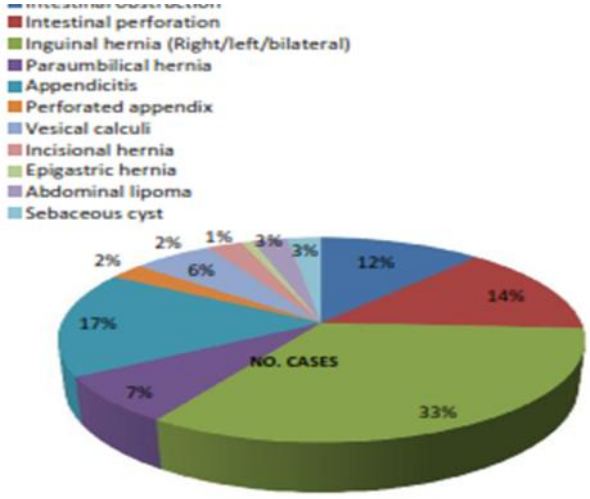

Figure 2: Distribution of cases Based on the Diagnosis of the patients randomly selected for the study.

Based on the type of wound, most of the cases had clean wound (59 ie, 49%), followed by clean contaminated (27) and contaminated wounds (28).

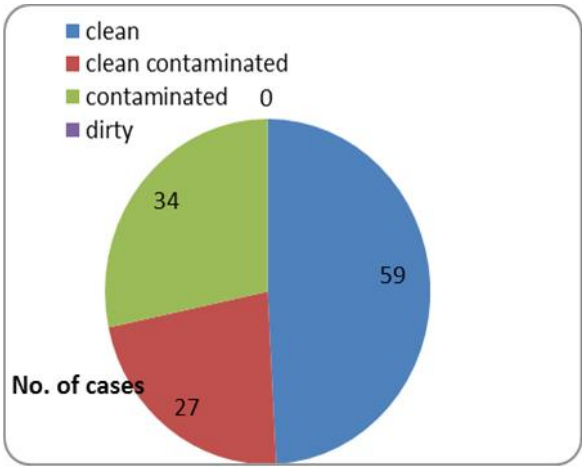

Figure 3: Distribution of cases based on wound type

Majority of cases i.e, 40 (33.3%) belonged to inguinal hernia, followed by appendicitis (20), intestinal perforation (17), intestinal obstruction (14), paraumbilical hernia (9), vesical calculi (7). Other less common cases were that of perforated appendix, incisional hernia, epigastric hernia, abdominal lipoma and sebaceous cyst.

Of all cases of Inguinal hernia (40), 15, 11 and 14 cases were sutured with simple, mattress and subcuticular sutures respectively. All cases of paraumbilical, incisional and epigastric hernia were sutured with mattress suture. Abdominal wall lipoma and sebaceous cyst were sutured with simple or subcuticular sutures. Tension suture was not used in any of the clean wounds mentioned above.

Clean contaminated wounds were found in appendicitis and vesicle calculi. Of the seven cases of vesicle calculi, 5 and 2 were sutured with simple and mattress suture respectively. Eight and twelve cases of appendicitis were respectively sutured with simple and subcuticular

sutures. Among the contaminated wounds, mattress suture was used in one case of intestinal obstruction and three cases of perforated appendix respectively. Also tension suture was employed in 14 and 17 cases of intestinal obstruction and intestinal perforation respectively.

In simple type of suturing, on Postoperative day (POD) 3-7, pain was seen in 11 patients, redness was seen in 12 patients while serous discharge was seen in 4 patients. On POD 8-11, pain was seen in seven, redness in three, serous discharge in one while pus discharge in one patients. On POD 12-14, the pain was seen in one, redness in two, serous discharge, pus discharge and wound dehiscence in one each. Suture removal was done on POD 7 for 11 cases (36.67%),on POD 9 for 10 cases(30%),on POD 11 for 8 cases (26.67%). Only one case developed wound dehiscence. Suture removal was done for this case on POD 12. Patient developed superficial partial wound dehiscence, which was healed by secondary intention.

In subcuticular type of suturing, on POD 3-7, pain was seen in 6 patients, redness was seen in 6 patients while serous discharge was seen in 1 patients. No signs were seen on further visits.

Table 1: Distribution of cases based on type of sutures used

Types of sutures	CLEAN TYPE OF WOUNDS					
	Inguinal hernia	Para umbilical hernia	Incisional hernia	Epigastric hernia	Abdominal wall lipoma	Sebaceous cyst
Simple	15	0	0	0	1	1
Mattress	11	9	3	1	0	0
Subcuticular	14	0	0	0	2	2
CLEAN CONTAMINATED TYPE OF WOUNDS						
	Acute appendicitis		Vesicle calculi			
Simple	8		5			
Mattress	0		2			
Subcuticular	12		0			
CONTAMINATED TYPE OF WOUNDS						
	Intestinal obstruction		Intestinal perforation		Perforated appendix	
Mattress	1		0		3	
Tension	14		17		0	

Table 2: Observational Findings of the sutured site on Post operative day 3-7, 8-11 and 12-14.

	Pain	Redness	Hematoma	Serous discharge	Pus discharge	Wound dehiscence
Type of suture	**Day 3-7**					
Simple	11	12	0	4	0	0
Subcuticular	6	6	0	1	0	0
Mattress	20	22	1	10	0	0
Tension	29	28	1	23	4	0
	Day 8-11					
Simple	7	3	0	1	1	0
Subcuticular	0	0	0	0	0	0
Mattress	19	11	0	7	2	3
Tension	29	19	2	21	10	6
	Day 12-14					
Simple	1	2	0	1	1	1
Subcuticular	0	0	0	0	0	0
Mattress	4	2	0	1	1	3
Tension	12	5	0	8	6	8

Suture removal was done for 26 cases on POD 7 remaining 4 were done on POD 9. No case developed wound gape or wound dehiscence. Although the cases included in subcuticular sutures included clean and clean contaminated type of wounds, the results were excellent in spite the co morbid factors like type 2 DM in 2 cases of inguinal hernia , hypertension in one case of inguinal hernia and hypoprotenamia in one case of appendicitis.

In mattress type of suture, on POD 3-7, pain, redness, hematoma and serous discharge was seen in 20,22,1 and 10 patients respectively. On POD 8-11, pain was seen in 19, redness in 11, serous discharge in 7, pus discharge in 2 patients, while wound dehiscence in 3 patients. On POD 12-14, pain was seen in 4, redness in 2, serous discharge in 1, pus discharge in one while wound dehiscence in 3 patients. Suture removal was done for 5 cases on POD 9, for 13 cases on POD 11, for 3 cases on POD 12, for 6 cases on POD 13. And remaining 3 cases suture removal was done on POD 14 as they developed complete wound dehiscence. The cases that developed wound dehiscence were inguinal hernia having diabetes type 2 and hypertension, obstructed inguinal hernia having hypoproteinaemia and para umbilical hernia having type 2 DM.

In tension type of suture, on POD 3-7, pain, redness, hematoma, serous discharge and pus discharge was seen 29,29,1,23 and 4 patients respectively. On POD 8-11, pain, redness, hematoma, serous discharge, pus discharge and wound dehiscence was seen 29,19,2,21,10 and 6 patients respectively. On POD 12-14, pain, redness, serous discharge, pus discharge and wound dehiscence was seen 12,5,8,6 and 8 patients respectively. Suture removal was done o POD 12 for 3 cases and POD 14 for the remaining 27 cases. Total of 8 cases out of 30 contaminated cases developed wound dehiscence and burst abdomen. These cases were taken up for secondary suturing (5/8). In remaining 3 cases healing was carried out by secondary intension. The cosmetic outcome of the scar was fair based on the linear scar with other scar marks (railroading) with prominent margin in opposition.

DISCUSSION

Given the suturing techniques, the type if incision, the diagnosis, the type of wound, co morbid factors, pathology; comparison between the suturing techniques is not possible. Also given the short duration of study and limitation in the number of cases, the scope of the findings is limited.

A total of 27 cases had clean contaminated type of wounds. Out of which 20 cases were acute appendicitis and remaining 7 were vesical calculi. Out of the 20 cases of acute appendicitis 8 were given simple sutures and the remaining 12 were given subcuticular sutures. 5 out of 7 cases of vesical calculi were given simple sutures and only 2 cases were given mattress sutures. In case of clean contaminated type of wounds no case of simple, mattress or subcuticular sutures developed any wound gape or wound dehiscence. Although subcuticular suture is thought to be associated with much better wound healing and wound edge approximation alone was clearly poor with mattress sutures as evidenced by increased superficial wound dehiscence.

In case of contaminated wounds, tension sutures gave good results (73.33%) along with better approximation, where it would have been impossible to achieve adequate approximation without tension over the suture line. Out of the 34 contaminated cases, 30 cases were given tension sutures and 4 cases were given mattress sutures. Total of 9 cases out of 34 contaminated cases, developed wound dehiscence and burst abdomen. Mattress sutures were used on 4 contaminated cases out which only one case developed wound dehiscence giving results of about 75%.

It has been observed in our study that subcuticular sutures gave better results in clean cases as none of cases developed any wound dehiscence in 18 out of 59 clean cases, giving 100% results. Whereas the results in simple sutures were 94.11% and mattress were 87.5% in clean cases. Across the studies, subcuticular sutures were observed to have decreased wound morbidity like wound dehiscence, discharge and yielded better cosmetic results compared to interrupted sutures [5-9]. Macdeen et al observed no difference in terms of wound morbidity, pain cosmesis and scar satisfaction [10]. Ibrahim MI et al observed that obese patients with subcuticular sutures showed significantly better short term cosmetic results, yet, with slightly higher risk of superficial incisional surgical site infection and significantly more post-operative pain [11]. Kobayashi et al observed that patients in the subcuticular suture group were significantly more satisfied with their wound though objective wound assessment was similar [12]. Tanaka et al observed that patients preferred subcuticular closure technique, citing better cosmetic results and less pain [9]. Wang H et al showed that there is no difference in post operative pain in interrupted and subcuticular cases [6]. Cosmetic results are better with subcuticular suturing technique than with mattress suturing technique. This is in correlation to the prospective randomized trial by Zwart H Ruiter and et al [13].

In our study mattress suture removal was done for 43.33% cases on POD 11. Remaining sutures were removed on POD 9, POD 12, POD 13 and POD 14 for 16% cases, 10% cases, 20% cases and 10% cases respectively. Three out of 30 cases taken in for mattress suturing technique developed complete wound dehiscence. Out of the 3 cases 2 were clean type of wounds, but due to the associated co-morbidities and poor general condition patient developed complete wound dehiscence. The third case was of the contaminated type also associated with co morbid factors developed wound dehiscence.

It was observed that surgeons opted for mattress su-

tures for obese patients and for clean contaminated type of cases which showed a selection bias, however objective scar assessment yielded similar results for all the cases of simple mattress subcuticular sutures, despite the selection bias. Mattress sutures were taken more frequently in older age group as skin tends to get inverted; hence it needs to be everted for proper apposition which is homologous with shah F et al [14]. Rail roading is seen in mattress sutures which can be decreased by early removal of sutures. Also timely removal shows better cosmetic appearance as observed in our study. This is shown by Zuber T.J. et al [15]. Mattress sutures were used on 4 contaminated cases out which only one case developed wound dehiscence giving results of about 75%.

In simple sutures, the knots should be placed away from the opposed edges of the wound. Normally, remove nonabsorbable suture after 6-7 days. In certain situations, non absorbable sutures can be removed at 10-12 days. Short-duration non absorbable sutures, are sufficient since the skin in these areas is very well vascularised and heals relatively quickly. Further, a shorter time span should diminish the scarring effect of sutures left in longer (ie, “railroad tracks"). However, in areas of higher skin tension or mobility, sutures should be left in longer to allow increased wound strength prior to removal of the sutures [16].

Tension sutures have already been shown to reduce the rate of wound dehiscence after surgery [17-20] and their use has also been suggested as a treatment choice for managing fascial dehiscence [21, 22] . Complications such as intestinal damage [23- 25]. Skin maceration and cutting lesions [21. 26, 27] surgical site infections, and patient pain or discomfort [17, 28] prohibit the surgeons from performing this technique. However, in the presence of a high possibility for developing abdominal wound dehiscence due to the accompanying conditions, the benefits of tension sutures may outweigh the disadvantages and the technique should be considered. In a study with a large sample size, reported a lower rate of incidence for abdominal wound dehiscence when tension sutures are used at the time of wound closure. They suggested that the selection of patients from the high-risk population is essential for raising the benefits against the costs of preventive approaches [18]. In contrast, Hubbard and Rever concluded there were no advantages in applying tension sutures for the prevention of abdominal wound dehiscence [27]. Our study showed lower incidence of complete wound dehiscence i.e. only 3 cases out of 30 developed complete wound dehiscence and 5 cases out of 30 developed superficial partial wound dehiscence.

The decreased incidence of abdominal wound dehiscence in our study is in line with some other studies. Goligher et al.,suggested that reinforcing the routine methods of closure with retention sutures or application of a wire suture would result in fewer cases of dehiscence [26]. However, we should note that the incidence of dehiscence in our study (26.67%) was higher compared to others.

Limitation of our study was the small sample of cases of laparotomy in patients with risk factors of abdominal wound dehiscence. Furthermore, the short follow-up period for observing the development of incisional hernia should be replaced by a much longer period to assess development of incisional hernia.

CONCLUSION

The suturing technique is a complex operation involving a surgeon-specific mix of cognitive and technical components. Notwithstanding the surgeon importance, the choice of the correct suture is fundamental for tissue healing and patient recovery. Usually, this choice takes into account the patient, the type of wound and tissue characteristics and also the anatomic region. An inelastic suture cannot be placed to the area where the tissues or incision subjected to stretch often.

Conflict of interest : Nil

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