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Original Research Article

Outcome of skin incision by cautery versus steel scalpel in hernia surgery: a prospective cohort study at a tertiary medical college hospital in South India

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ABSTRACT

Background: Since a long time, skin incisions have routinely been made with scalpels. Now a days there is a shift in trend from this method to electrosurgical skin incisions. However, fear of bad scars and improper wound healing has prevented its wide spread use. The aim of the study was to compare the Diathermy versus Scalpel skin incision in elective hernia surgeries with regards to post-operative pain, post-operative wound infection rate and wound healing.
Methods: A total of 200 patients were taken for this study. 100 patients underwent diathermy incision (group A) who were compared with 100 scalpel incision patients (group B). Variables used in this study were postoperative pain, wound infection and scar.
Results: Patients with diathermy skin incision were having less post-operative pain which was assessed by visual analogue scale when compared with scalpel incision since the p value was 0.01 which is significant (<0.05). The postoperative infection rate and scar were comparable in both the groups since the p-value is >0.05 in each which is insignificant.
Conclusions: Diathermy incisions are therefore less harmful to the skin. It has got more advantages than scalpel incisions like less postoperative pain.

Keywords: Electrosurgery, ESU, Monopolar, Surgical site infections, Visual analogue scale

INTRODUCTION

Surgical incisions are usually made with scalpel. Usage of scalpel, usually results in skin bleeding which obscure the operating field resulting in wastage of operating time. Other alternative in making surgical incision is diathermy. Diathermy is mainly used for tissue dissection and hemostasis.[1] Usually skin incision by diathermy is avoided due to fear of deeps burn, poor wound healing and excessive scarring. These presumptions stem from experimental and clinical studies that yielded varied reports.[2,3] Modern electrosurgical units capable of delivering pure sinusoidal currents have evolved a change in this concept. The advantages are rapid hemostasis, faster dissection, and a reduced overall operative blood loss.[4,5] Majority of studies had compared electrocautery and scalpel incision in terms of wound infection, postoperative pain, blood loss, duration of healing and postoperative wound complication in only selected groups of patients with the exclusion of patients with medical co-morbidities.

No single study to date has focused on diathermy incisions in elective surgical cases exclusively so as to figure out the post-operative wound infection rate. This study was conducted to compare diathermy and scalpel incisions in terms of postoperative pain, wound healing i.e. scar character and postoperative wound infection.

METHODS

This was a cohort study carried out in the Department of Surgery, Government Medical College, Kozhikode, Kerala, India from January 2015 to December 2015 after approval by Ethics committee. A total of 200 male patients who were admitted for elective hernia repair surgery were selected in the study. 100 patients in group 1 had diathermy skin incision whereas 100 patients in group 2 had conventional scalpel incision. Inclusion criteria was male patients aged between 15 and 60 years admitted for elective inguinal hernia repair surgery. Exclusion criteria included surgically scarred tissues, immunocompromised patients (diabetes, smoking, hypertension, anaemia), patients with pacemaker device.

After getting consent and explaining about the merits and demerits of the study, the patients were enrolled in the study. They were adequately prepared and all pre-op investigations done. All the patients were operated under local anaesthesia. Prophylactic antibiotic injection cefotaxim 1gm was given 1 hour before surgery. Premedications given were injection nalbuphine 5mg and injection Phenergan 12.5mg given 10 minutes before surgery. 50:50 mixture of 30ml lignocaine with adrenaline and 30ml of normal saline given as the local anaesthetic. Transverse skin crease incision of size 5-6cm is made 2 finger breadths medial and inferior to anterior superior iliac spine. ALAN electrosurgical unit was used providing a maximum power of 120 watts. Current intensity in pure cutting mode for skin incision was set at reading 25. Hemostasis was performed with coagulation diathermy, and large blood vessels were sutured/ligated in both groups. Prolene mesh repair done in both groups irrespective of direct and indirect hernia. Mesh was fixed with 2-0 prolene. External oblique closed with 2-0 prolene. Subcutaneous tissue (Scarpa and camper layer) was closed with using 2-0 vicryl (polyglactin 910 suture) and skin closure was done using ethilon 3-0. Post op analgesia was achieved by inj. Tramadol 50mg i.v. 12 hourly for the first 24 hours followed by tab. Diclofenac 50mg orally 8 hourly for the next 24 hours and sos for next 24 hours.

The patients were followed up and the post-operative pain was assessed on the 1st,2nd and 3rd post-operative days on a fixed time using the visual analogue scale which was represented by a straight line measuring 10 divisions, the extremes of which corresponded to no pain at one end and worst pain at the other end.

The patients were further followed up and the wound was inspected on 2nd post-operative day and betadine ointment was applied and open dressing was done thereafter. The patient was discharged at 4thpost operative day after the wound assessment was done for both wound healing and infection. The suture was removed on 10th postoperative day in ward when the patient came for review. The patient was followed up after 2 weeks and at the end of 1 month for assessment of wound healing and infection. Thus, wound assessment for wound healing i.e. scar and wound infection were done on 4th, 10th, 14th, 28th post-operative days. Assessment of wound infection was done by history, clinical examination and was graded according to Southampton wound scoring system: grade I, normal healing with mild bruising or erythema; grade II, erythema plus other signs of inflammation; grade III, clear or serosanguinous discharge; and grade IV, purulent discharge and grade V, deep or serious wound infection with or without tissue breakdown. Pus culture and sensitivity was done if infection present and antibiotics given accordingly. Manchester scar scale was used for assessing wound scar (scar is formed physiologically end of one month), which included color, matte or shiny, contour, distortion and texture. Assessment of:

- Post-operative pain- association between scalpel and cautery (chi square test)
- Wound scar- association between scapel and cautery (chi square test)
- Wound infection- association between scalpel and cautery (chi square test).

RESULTS

A total of 200 patients with 100 patients in each group were studied. The statistical contents like arithmetic mean, standard deviation, percentage etc. were computed to get valid inference about data for comparison. In order to see whether the difference in estimates were statistically significant, chi square test was applied. Diagrams and charts were drawn to give due importance to the most salient findings. A p-value of less than 0.05 was considered statistically significant.

Table 1: Distribution of study subjects according to their mode of incision.

Mode of operation	Number of subjects	Percentage
Diathermy	100	50.0
Scalpel	100	50.0
Total	200	100.0

Total sample in the study was 200 with 100 in diathermy group and 100 in scalpel group.

Age and sex

Mean age was 50.95 years with standard deviation of 4.88 years. Mean age in diathermy group was 50.7 years with standard deviation of 4.503 years and in scalpel group was 51.2 years standard deviation of 5.242 years. All subjects were male. Median pain scale was higher among those subjects who underwent steel scalpel incision compared to diathermy. It was found to be statistically significant ($p<0.01$).

Table 2: Association between pain scale and mode of incision.

Mode of operation	Median pain scale	Range	Mann-Whitney U	p-value	Significance
Diathermy (n=100)	3	2	1450	<0.01	Significant
Scalpel (n=100)	5	3			

Table 3: Association between post-operative infection and mode of incision.

Mode of operation	Post-operative infection			Total
	0	1	2	
Diathermy (n=100)	31	45	24	100
	31.0%	45.0%	24.0%	100.0%
Scalpel (n=100)	32	44	24	100
	32.0%	44.0%	24.0%	100.0%
Total	63	89	48	200
	31.5%	44.5%	24.0%	100.0%

Chi square value=0.027, p-value=0.987 (insignificant). The postoperative wound infection was of almost similar incidence in both the groups since p-value was insignificant (>0.05).

Table 4: Association between scar colour and mode of incision.

Mode of operation	Scar colour		Total
	1	2	
Diathermy (n=100)	92	8	100
	92.0%	8.0%	100.0%
Scalpel (n=100)	91	9	100
	91.0%	9.0%	100.0%
Total	183	17	200
	91.5%	8.5%	100.0%

Chi square value=0.064, p-value=0.800 (insignificant). There was not much difference in scar colour between the two groups as p-value was greater than 0.05.

Table 5: Association between matte/shiny and mode of incision.

Mode of operation	Matte/shiny		Total
	1	2	
Diathermy (n=100)	78	22	100
	78.0%	22.0%	100.0%
Scalpel (n=100)	73	27	100
	73.0%	27.0%	100.0%
Total	151	49	200
	75.5%	24.5%	100.0%

Chi square value=0.676, p-value=0.411 (insignificant). The appearance of the scar was almost similar in both the groups since p-value was insignificant.

DISCUSSION

In this study, we compared the effects on postoperative pain, surgical site infection and scar of the use of electrocautery versus scalpel for inguinal hernia repair surgeries. The use of electrocautery reduced postoperative pain, but did not influence the rate of wound complications. Positive associations were found regarding postoperative pain as statistical analysis showed significant p-value.

Table 6: Association between contour and mode of incision.

Mode of operation	Contour		Total
	1	2	
Diathermy(n=100)	94	6	100
	94.0%	6.0%	100.0%
Scalpel (n=100)	93	7	100
	93.0%	7.0%	100.0%
Total	187	13	200
	93.5%	6.5%	100.0%

Chi square value=0.082, p-value=0.774 (insignificant). The scar was of similar contour in both the groups.

In accordance with previous studies, our results suggested a significantly reduced postoperative pain in the diathermy group. There was total or partial injury to the cutaneous nerves in the area of the surgical wound with a reduced postoperative pain profile in patients who had diathermy skin incisions.[6] Kearns et al also concluded that the use of diathermy for skin incision was associated with lesser early postoperative pain and less analgesia requirement.[7] Ahmad et al also noted similar findings that postoperative pain was significantly less with diathermy incisions in first 24 hours.[8]

Table 7: Association between distortion and mode of incision.

Mode of operation	Distortion			Total
	1	2	3	
Diathermy (n=100)	85	12	3	100
	85.0%	12.0%	3.0%	100.0%
Scalpel (n=100)	83	14	3	100
	83.0%	14.0%	3.0%	100.0%
Total	168	26	6	200
	84.0%	13.0%	3.0%	100.0%

Chi square=0.178, p-value=0.915 (insignificant). The scar distortion was also comparable in both the groups.

Present study implied that diathermy did not increase the postoperative infection rate compared to scalpel. It had been suggested that local tissue heating increases subcutaneous oxygen tension, thus enhancing the resistance of the surgical wounds to infection.[9] Groot et al

studied wound infection rate in cases of abdominal or thoracic wounds and compared the electrocautery and steel scalpel. They found that electrocautery did not increase the wound infection rate.[10] Ahmad et al also revealed the similar findings and stated that post-operative infections were comparable in diathermy and scalpel groups.[8]

Table 8: Association between texture and mode of incision.

Mode of operation	Texture		Total
	1	2	
Diathermy (n=100)	94	6	100
	94.0%	6.0%	100.0%
Scalpel (n=100)	93	7	100
	93.0%	7.0%	100.0%
Total	187	13	200
	93.5%	6.5%	100.0%

Chi square=0.08, p-value=0.774 (insignificant). There was not much difference in scar texture in both the groups.

On the basis of this study, it is suggested that the skin might be safely incised using electrosurgery. Complications like contracted wounds, hypertrophic scar formations and increased infections rates were not found. The use of diathermy for skin incision during inguinal hernioplasty was found as safe as the use of scalpel in terms of wound healing and scar characteristic. This result was also in concordance with other studies.

CONCLUSION

Diathermy is an effective means of reducing postoperative pain in inguinal hernia repair surgery compared to scalpel. Diathermy is as safe as scalpel regarding the incidence of postoperative wound infection. Post-operative scar in incisions where diathermy is used, is as same as in scalpel.

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