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Research Article

COMPARISION OF EFFICACY OF ELECTROCAUTERY VERSUS CONVENTIONAL SCALPEL FOR SKIN INCISION FOR LITCHENSTIEN MESH HERNIOPLASTY

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A B S T R A C T

Background: Skin incisions have traditionally been made using a scalpel. Recent studies suggest that electrocautery may offer potential advantages with respect to blood loss, incision time and postoperative pain.

Aim: The aim of this study was to compare the efficacy and safety of electocautery versus conventional scalpel for skin incision for Lichtenstein mesh hernioplasty with an aim to evaluate electocautery as an effective alternative to scalpel incision.

Methods: This was a prospective randomized clinical study which was conducted in the Index medical college and hospital Indore from period April2013 to March 2014. A total of 125 patients were enrolled in the study. Of these, 65 patients to Group a (electrocautery) and 60 patients were randomized to Group B (Scalpel group).

Results: Demograph of the two groups did not differ significantly ($p > 0.001$). result showelectrocautery group were significantly quicker ($p = 0.001$), and associated with less blood loss ($P = 0.012$) compare to scalpel group.The mean visual pain analogue scale was significantly reduced more in the electrocautery group than in Scalpel group patients on postoperative day 1 ($p = 0.001$), day 2 ($p = 0.011$) and 3 ($p = 0.021$) respectively with the mean amount of intramuscular analgesic requirement was significantly less ($p=0.021$) in elecrocautery group. Postoperative complication rates did not differ significantly between the both groups ($p = 0.243$).

Conclusion: We conclude that electrocautery incision in elective inguinal hernioplasty has Significant advantages compared with the scalpel because of reduced incision time, less blood loss, reduced early postoperative pain and analgesic requirements.

INTRODUCTION

Surgeons have been always in search of an ideal method of making skin incision which would providequick and adequate exposure with minimum loss of blood. [1] Yet, there remains some controversy regarding the first step of the operation i.e. making the skin incision. While the cold scalpel (CS) has been the time-honored method of performing the skin incision, but these incision are more bloody and painful. The use of electrocautery (EC) has been gaining popularity in recent times. [2] Electrocautery mainly used for hemostasis and less often for skin incision. The use of electrode delivering pure sinusoidal current however allows tissue cleavage without damaging to surrounding areas. Electrocautery incision of this type is not true cutting incision.[3]This method heats cell within tissues so rapidly that they vaporize, leaving cavity within cell matrix, heat created disappears as steam, ratherthan being transferred to adjacent tissues. As electrode is moved forward new cells are contacted andvaporized with creation of incision. This explains absence of scaring and subsequent healing with less scarring. Many randomized clinical trials and studies have been conducted to compare electrocautery incision with scalpel incision over skin have shown that EC has a number of advantages over CS including reduced incision related blood loss, reduced incision time and reduced post-operative pain and analgesia requirement and there was no difference between the two in terms of postoperative wound complications.

However despite these evidences, many surgeons in many centers including our are still reluctant to use electrocautery as a 'cutting' instrument for skin and surgical incision because of belief thatheat generated by electrosurgical instruments cause devitalization of tissue within the wound which consequently lead to increased infection rates, delayed wound healing and excessive scar formation. [3] [4] [5] this is of special concern in inguinal hernioplasty where any infection in the presence of the prosthetic mesh could lead to disastrous consequences. This prospective, randomized controlled trial was conducted in our center to compare the efficacy and safety of electrocautery versus scalpel for skin incision in Lichtenstein mesh hernioplasty for inguinal hernia based on incision related blood loss, incision time, post operative pain and wound infection with aim to evaluate as an effective

alternative to scalpel incision. We present our results and review the existing literature on the subject.

MATERIALS AND METHODS

Source of Data

125 cases undergoing Lichtenstein inguinal mesh hernioplasty for inguinalhernia in index medical college and research center, Indoreover period of one year from April2013 to March 2014

Method of Collection of Data

Study Design: Randomized control trial. Randomization done according to block randomization method

The observer is blinded to the type of incision used and gave his observation based on the predefined criteria. Ethical clearance has been obtained from "Ethical Clearance Committee" of the institution for the study.After taking the informed consent, patients are randomized and divided in two groups A and B.

In Group A(60 pt)- Incision is taken with electrocoutery needle using pulse sine wave current /pure sinusoidal current and powersetting of 70 watts. Hemostasis is achieved with forced coagulation.In Group B(65 pt)-Skin incision is taken with scalpel,bleeding controlled by forced coagulation using pulsesine wave on power supply 30 watts.

All standardized incision will be medial 3/5 and 2.5 cms above and parallel to inguinal ligament.

All the procedures are carried under standardized spinal anesthesia.Premedication is given inj. ceftriaxone 1gm just before giving skin incision. Closure of the abdominal layer is done with continuous proline for external aponeurosis, vicryl 2/0 for subcutaneous tissue and mattress suture with 2-0 nylon for skin closure.

Exclusion criteria

1. Complicated inguinal hernia like irreduciblehernia, obstructed hernia, strangulated hernia.
2. Preoperative use of analgesics for >3 days perweek for >3 months.
3. Paediatric [<12 yrs] and geriatric [>60yrs] patients.
4. Patients with chronic pain >3 months.
5. h/o drug or alcohol abuse
6. Severe hepatic, renal, cvs dysfunction.
7. Immunocompromised Status.

Outcome

1. Mean operative time (sec/ cm^2): Wound area (length x depth) was determined bynoting the exact length of the incision and depth witha sterile tape at the end of the procedure beforeclosure of the wound. Incision time was noted from the start of making skin incision till complete opening of external oblique apponeurosis, adding the time required tosecure hemostasis in this step.
2. Operative blood loss (ml/cm^2): Dry gauze packs (pre-weighed) were used for this particular step to measure the blood loss in each group.with each gram taken as equal to one milliliter of blood (i.e. 1 g = 1 ml). No suction evacuation of blood was done while making the skin incision. The amount of blood was calculated as ml/cm2.
3. Postoperative pain: Assessedby using pictorial visual analogue scale from 0 (no pain) to 10 (worst pain imaginable) on each postoperative morning (up to3days). If pain score is >4 injdiclofinac sodium 50 mg i.m. was given. Below given VAS was used where patient will be asked to mark a number compared to his pain:
4. Post operative complications noted during hospital stay and followup, are measured bySmeans of Seroma-collection of serous discharge in suture site.

Hematoma-collection of blood clots
Purulent – collection of purulent discharge

SPSS 16 was used for statistical analysis. Various mean values along with standard deviation were calculated. Unpaired Student's t test and Pearson's x2 was used to assess the inferential values. A value of $p < 0.05$ was considered as statistically significant.

RESULTS

Outcomes measured
Pts damogrphy in terms of age and sex
Total time taken in performing operative procedure
Mean blood loss while making skin incision
Postoperative pain
Requirement of analgesia postoperatively
Wound related complication

Patient demographs

There were no significant demogrophic differences between two groups.
Mean age of patient in group Ai.e.electrocautery group is 47.8±16.21 and in group B i.e. scalpel group
is 47.7± 13.95($p = 0.345$)

Mean incision time

The mean time taken for incision was 2.7 sec/cm for the electrocautery knife versus 4.2sec/cm2 for the scalpel. The difference between the two groups with respect to the mean incision timewas statistically significant ($p = 0.001$).

Mean incisional blood loss

The mean incisional blood loss was 1.62 ±0.14 ml/cm^2inscalpel group, while it was 1.12 ±0.20 ml/cm^2inelectrocauterygroup. Electrocautery group hadsignificantly less bleeding than the scalpel group ($p = 0.012$).

Post operative pain

Post operative pain is assessed by visual analogue scale aton each postoperative morning. In our study results are analyzed with Mann Whitney U Test. results are shown in Table 2. The mean VAS was significantlyreduced more in Group A (electrocoutery group) than in Group B (Scalpel group) patients onpostoperative day 1 ($p =0.001$), day 2 ($p= 0.011$) and 3 ($p =0.021$) respectively.

Analgesic requirements post operatively

Dose of analgesic i.e. diclofenac 50 mg i.m. are recorded in both groups post operatively, results are shown in table 3. Results analyzed using MannWhitney U test. The mean

amount of intramuscular analgesic requirement was significantly less in the Elecrocauterygroup (1.33cc) than in the Scalpel group (2.81cc) (p= 0.021)

Local wound complications

Overall wound complications are assessed for 7 days post operatively. In our study we found there was no significant difference between the two groups in tissue response apart from slight erythema and edema seen in group A, which disappears in few days.Seroma in both groups arecomparable 13 pt in group A and 17 pt in group B. Although scalpel group shows more hematoma [23%] compare to [18%] in electrocautery group, difference is not statisticallysignificant. Other complication i.e. purulent collection in post operative wound was recorded in 8 patients giving an overall postoperative woundinfection rate of 13.1%. The postoperative wound infection rates in the Scalpel group andelectrocautery group were 14.8% (5/65) and 13.2% (3/60) respectively.

DISCUSSION

Surgical was introduced at the beginning of the 20 th century [7],[8],[9],[10] to obviate the inherent disadvantages of steel scalpel, i.e. (1) lack of hemostasis leading to undesired blood loss; (2) indistinct tissue planes; (3) increased operative time; (4) use of foreign material (ligature) in the wound, leading to infection risk; (5) possibility of accidental injury in the operations theater; and (6) potential for tumor metastasis through lymphatic channels. [11],[12],[13]

With the advent of modern electrosurgical units capable of delivering pure sinusoidal current, this technique is now becoming extremely popular because of rapid hemostasis, faster dissection and reduced overall operative blood loss. [14],[15],[16],[17],[18] However, electrosurgery may cause complications, with electrical burns being the most common hazard in operating room. [19] Inadvertent burns may occur at the surgical site or at the site of placement of the dispersive electrode (grounding pad). [20],[21],[22] Electrosurgery related fire hazards have also been reported in the literature before the advent of non-explosive anesthetic agents.

Following the introduction of halothane, electrocautery are increasingly used for tissue dissections except for skin incision. Early studies with primitive machines suggested that electrocautery incisions were associated with just such charring and poor wound healing8. However the development of oscillator units capable of delivering pure sinusoidal current has generated renewed interest in electrocautery incisions

As per literature electrosurgery has been widely used by Peterson in reconstructive and cosmetic faciomaxillary surgery[23], Mann and Klippel in paediatric surgery[24], Kamer in rhitidoplasty[25], Tabin in blepheroplasty[26], and Sheikh in neurosurgery[27]with minimum scarring and excellent results. A skin incision in general surgery was reported by Dixon and Watkin in patients undergoing inguinal herniorhaphy and cholecystectomy.

Furthermore, in this eraof increased rates of surgicalexposure to blood borne diseases such as hepatitis B& C and human immunodeficiency virus infections due to sharp injury from use of scalpel is most compelling reason to use cutting electrocautery instead,as the injuries from the scalpel account for 18% of surgical staff cutting injuries, second only to injuries from suture needles, which account for 41% of staff cutting injuries, according to 2009 statistics.

The use of for skin incision during inguinal hernioplasty was found as safe as the use of scalpel in terms of wound healing and reduces the analgesic requirements in the postoperative period.[29]. In this study the mean time recorded for completing the incision with all the necessary hemostasis was 2.7 sec/cm^2 for the electrocautery knife versus 4.2sec/$cm^2$for the scalpel(p = 0.001)., so the electrocautery knife decreases the time needed to complete the incision to the half. there was statistically significant less bleeding 1.12 ± 0.20 ml/cm^2 in electrocautery group compare to1.62 ± 0.14 ml/cm^2 in scalpel group(p = 0.012).

In ourstudy the mean VAS was significantly reduced more in Group A (electrocoutery group) than in Group B (Scalpel group) patients on postoperative day 1 (p =0.001), day 2 (p= 0.011) and 3 (p =0.021) respectively (table2). Results analyzed using MannWhitney U test. The mean amount of intramuscular analgesic requirement was significantly less in the electrocauterygroup (1.33cc) than in the Scalpel group (2.81cc) (p= 0.021).

There was no significant difference between the two groups in tissue response apart from slight erythema and edema which disappears in few days in group there were no significant differences in wound infections between the two groups (5 in group A and 3 in group B).

The above data shows a significant advantage for the exclusive use of electrocautery in creating surgical incisions in inguinal hernias. The traditional fears of excessive tissue devitalization and poor healing were not reflected in this study, which is comparable with other study.

CONCLUSION

The electrocautery skin incision shows significant advantages in the conservation of blood andincision time.It is associated with reduced early postoperative pain and less analgesic requirementand also fear of increased infection rates is unfounded. So Electrocoutery is a safe and effective method to make skin incision and hence recommended.

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