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SCALPEL VERSUS ELECTROCAUTERY FOR SKIN INCISION IN ELECTIVE INGUINAL HERNIOPLASTY: A RANDOMIZED CONTROLLED TRIAL

General Surgery

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ABSTRACT

Background: Electrocautery offers several intraoperative advantages, including reduced incision time, a nearly bloodless surgical field, and decreased infection risk through minimized instrument contact. However, concerns regarding wound healing and scarring have limited its widespread adoption in certain surgical procedures.**Objective:** To compare the safety and efficacy of skin incisions made using a scalpel versus electrocautery in patients undergoing elective inguinal hernioplasty.**Methods:** This prospective, randomized controlled trial was conducted at Aarupadai Veedu Medical College and Hospital, Puducherry, and included 80 patients scheduled for elective inguinal hernioplasty. Participants were randomly assigned into two equal groups: Group A (scalpel, n = 40) and Group B (electrocautery, n = 40). Primary endpoints were postoperative wound healing and complications. Secondary outcomes included incision time, intraoperative blood loss, postoperative pain scores, analgesic requirement, and length of hospital stay.**Results:** The mean age of participants was 47.65 years, with no significant demographic differences between the groups. Compared to the scalpel group, the electrocautery group demonstrated significantly shorter incision times and reduced intraoperative bleeding ($p < 0.05$). Postoperative pain scores were consistently lower in the electrocautery group, which also required fewer doses of analgesics at all observed intervals ($p < 0.05$). No statistically significant differences were found in wound complications or hospital stay duration between the groups. Notably, cosmetic outcomes were superior in the electrocautery group, with significantly lower Manchester scar scores at 2 weeks, 1 month, and 3 months postoperatively ($p < 0.05$).**Conclusion:** Electrocautery is a safe and effective alternative to the scalpel for skin incisions in elective inguinal hernioplasty. It offers several clinical benefits—including reduced incision time, less bleeding, lower postoperative pain, and improved cosmetic results—without increasing complication rates or hospital stay duration. These findings support the routine use of electrocautery in similar surgical settings.

KEYWORDS

INTRODUCTION

Traditionally, skin incisions in surgery have been made using a scalpel, which, although effective, can lead to bleeding that may obscure the surgical field and complicate visibility during the procedure [1]. Electrocautery, on the other hand, offers distinct advantages such as reduced incision time and a nearly bloodless field. It is widely employed for tissue dissection due to its ability to achieve rapid hemostasis and facilitate quicker operative progress [2,3]. Moreover, electrocautery minimizes the risk of sharps-related injuries and potential transmission of infections to surgical staff when compared to traditional scalpel use [4].

In procedures like elective inguinal hernioplasty, electrocautery has demonstrated benefits in reducing postoperative pain and complications such as seroma, hematoma, and wound dehiscence, which can ultimately lead to shorter hospital stays [5]. Since its introduction in the early 20th century, electrocautery has contributed significantly to reducing both intraoperative and postoperative complications [6–8].

Despite its broad use for tissue dissection, many surgeons remain hesitant to use electrocautery for skin incisions, primarily due to concerns about poor wound healing, increased infection risk, and suboptimal cosmetic outcomes [9–11]. However, given its advantages—including enhanced hemostasis, decreased postoperative discomfort, and fewer wound-related complications—electrocautery warrants greater consideration for use in skin incisions. Continued comparative studies between electrocautery and scalpel incisions, particularly in clean surgical procedures like elective inguinal hernia repair, are essential to guide evidence-based surgical practice and expand its application across a wider range of surgeries [12–14].

MATERIALS AND METHODS

This prospective randomized controlled trial was conducted in the Department of General Surgery at sri siddhartha medical college,tumkur. The study included patients aged 18 to 80 years scheduled for elective inguinal hernioplasty. Exclusion criteria comprised individuals with bleeding disorders, immunocompromised states, significant cardiovascular or renal disease, and those diagnosed with malignancies.

Over a two-year period, a total of 80 eligible participants were enrolled and randomly assigned into two equal groups (n=40 each), as determined by a sample size calculation referencing a previous study by Prakash et al. Patients in Group A underwent skin incisions using a scalpel, while the remaining patients in Group B received electrocautery incisions.

Patients in Group B received skin incisions made using electrocautery. Participants were recruited via convenience sampling and then randomly allocated to either group using a computer-generated random number table. The collected data included parameters such as postoperative wound healing outcomes and complications, duration of incision, intraoperative blood loss, postoperative pain levels, and length of hospital stay.

Statistical analysis was performed using standard methods. Continuous variables were summarized using mean and standard deviation, while categorical variables were expressed as frequencies and percentages. Data were presented using tables, pie charts, bar graphs, and other appropriate figures. For analysis, continuous variables were compared using the unpaired t-test, and categorical data were assessed using the Chi-square test. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 80 patients were included in the study, with a mean age of 47.65 years. There were no statistically significant differences between the scalpel and electrocautery groups in terms of demographic variables such as age, gender, place of residence, or physical parameters including weight, height, and BMI. Additionally, both groups were comparable regarding hernia-related characteristics, including the side of the hernia, recurrence status, and the type of inguinal hernia. Patients in the electrocautery group showed significantly better intraoperative outcomes, including shorter incision times and reduced blood loss ($p < 0.05$). Postoperatively, this group also reported significantly lower pain scores at multiple time points and required fewer doses of analgesics compared to the scalpel group ($p < 0.05$).

There were no statistically significant differences between the two groups in terms of wound-related complications or length of hospital stay. However, the electrocautery group demonstrated superior cosmetic results, reflected by significantly lower Manchester scar scores at 2 weeks, 1 month, and 3 months post-surgery ($p < 0.05$)

DISCUSSION

In elective inguinal hernioplasty, the choice between using a scalpel or electrocautery for skin incisions plays a significant role in influencing surgical efficiency and patient outcomes. While the scalpel has traditionally been preferred for its precision and the comfort level it provides to surgeons, it is often associated with greater intraoperative bleeding, which can obscure the surgical field. Electrocautery, by contrast, offers several advantages—including reduced blood loss, faster dissection, and superior hemostasis—which contribute to a clearer operative field and may reduce the risk of postoperative issues such as pain, seroma, hematoma, and wound dehiscence. However, despite these potential benefits, concerns regarding increased rates of infection and suboptimal scar formation have limited the widespread adoption of electrocautery for skin incisions.

This randomized controlled study was conducted at sri siddhartha medical college and hospital,tumkur, and involved 80 patients aged 18 to 80 years undergoing elective inguinal hernioplasty. Participants were randomly allocated into two groups: Group A, where skin incisions were made using a scalpel, and Group B, where electrocautery was employed. The primary objective was to compare the outcomes of these techniques concerning postoperative pain, wound healing, and overall recovery. Baseline demographic and clinical characteristics such as age, gender, residence, weight, height, and BMI were comparable between the two groups, ensuring homogeneity.

The average incision time in the scalpel group (Group A) was 5.5 ± 1.1 minutes, whereas in the electrocautery group (Group B), it was significantly shorter at 4.2 ± 1.2 minutes ($p < 0.01$). This aligns with the findings of Chauhan H et al., who also reported reduced incision times and intraoperative blood loss with electrocautery.

Regarding intraoperative bleeding, Group A exhibited a mean blood loss of 39.5 ± 5.5 ml, significantly higher than 9.4 ± 0.8 ml in Group B ($p < 0.01$). These findings are consistent with a study by Prakash L et al., which demonstrated notably lower blood loss per unit wound area when electrocautery was used, with no significant differences in postoperative pain or wound infection rates between the groups.

Postoperative pain was assessed using the Visual Analog Scale (VAS) at multiple intervals: 6, 12, 24, 36, 48, and 72 hours, as well as on the 7th postoperative day. Across all time points, Group B (electrocautery) reported significantly lower pain scores compared to Group A (scalpel), with p-values consistently at 0.01. For example:

At 6 hours, Group A had a mean score of 6.9 ± 0.7, while Group B had 5.0 ± 0.7.At 24 hours, scores were 5.8 ± 0.7 for Group A vs. 3.9 ± 0.7 for Group B.On postoperative day 7, pain scores were 2.7 ± 0.5 in Group A and 1.6 ± 0.5 in Group B These statistically significant results further support the analgesic benefits of electrocautery in surgical skin incisions. Similar outcomes were reported in the study by Ahmad H et al., reinforcing the clinical advantage of electrocautery in terms of reduced postoperative discomfort.

Ahmad H et al. similarly reported significantly lower mean postoperative pain scores at 24 hours in patients who underwent electrocautery incisions compared to those who had scalpel incisions.
In the present study, the mean analgesic requirement in the scalpel group (Group A) was 2.0 ± 0.7 doses, whereas the electrocautery group (Group B) required significantly fewer analgesics at 0.6 ± 0.5 doses ($p = 0.01$). Despite these differences in pain management, no significant variations were observed between the two groups concerning postoperative wound complications or the duration of hospital stay.

Cosmetic outcomes, assessed using the Manchester Scar Scale, were significantly better in the electrocautery group at all follow-up intervals:

At 2 weeks, Group A scored 7.8 ± 0.7, while Group B scored 6.8 ± 0.7 ($p = 0.01$) At 1 month, the scores were 10.0 ± 0.8 in Group A vs. 7.5 ± 0.8 in Group B ($p = 0.01$) At 3 months, the values were 9.6 ± 0.6 and 7.1 ± 0.7, respectively ($p = 0.01$)

These findings indicate that electrocautery incisions resulted in improved scar appearance over time. These results are in agreement with previous research, such as the study by Zarei F et al., which concluded that electrocautery is as safe as scalpel incisions for hernia repair, particularly with respect to scarring and infection risks.

While this study provides strong evidence in favor of electrocautery, a more detailed investigation including additional intraoperative variables could offer even greater insight.

CONCLUSION

Electrocautery represents a superior alternative to traditional scalpel incisions in elective inguinal hernioplasty. It offers multiple benefits, including shorter incision times, reduced intraoperative blood loss, lower postoperative pain, decreased need for analgesics, and improved cosmetic outcomes. Importantly, these advantages are achieved without an increased risk of postoperative complications or prolonged hospital stay. The findings of this study support the integration of electrocautery as a more efficient and patient-centered approach in the surgical management of inguinal hernias.

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