

DIATHERMY VERSUS SCALPEL INCISIONS FOR OPEN CHOLECYSTECTOMY ----- A COMPARATIVE STUDY

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ABSTRACT

Objective: The aim of the study was to make a comparison between skin incisions made with electrocautery versus scalpel in terms of their safety, efficacy and post-operative complications.

Design: A randomized controlled study.

Setting: The study was conducted in Combined Military Hospital (CMH) Kharian, Pakistan airforce (PAF) Hospital Sargodha.

Duration of Study: May 2008 to August 2011.

Patients and Methods: Ninety seven patients who underwent open cholecystectomy were randomly divided into two groups on the basis of the use of electrocautery versus steel scalpel for making skin incision and sub-cutaneous tissue dissection. Parameters recorded were, time taken from skin incision to full incising of the peritoneum, length of the wound, amount of blood loss during this step of surgery in each group. Post-operative pain scoring using visual analogue scale was done. Wound complications such as infection, haematoma/seroma and dehiscence were noted too. One month of follow up was recorded in each group. Subsequently a comparison of these findings was done.

Results: Incision time (sec/cm²) was longer in scalpel group than in diathermy group ($p = 0.001$), whereas, incision blood loss (ml/cm²) was significantly less in diathermy group than in scalpel group ($p = 0.03$). There was no difference in post-operative pain perception as delineated by visual pain analogue scoring system between the two groups ($p = 0.57$). Post-operative wound complications and the final healing of wound at 01month of follow-up were almost similar in both groups.

Conclusion: Electrocautery may be used safely without any untoward complication in making skin incision and sub-cutaneous tissue dissection with an advantage of reduced incision time and and less blood loss.

Keywords: Diathermy, Scalpel

INTRODUCTION

There has always been a fear of thermal injuries while using electrocautery for making skin incision¹. Although, diathermy has been excessively used for hemostasis and underlying soft tissue dissection, but its use for making skin incision has been mostly discouraged because of concern related to superficial burns, excessive post operative scarring resulting in poor cosmetic results and postoperative wound complications². Whereas, many observational studies and as well as some prospective experimental studies have painted contrary results^{3,4}.

The purpose of our study was to evaluate

the hypothesis that use of electrocautery while making skin incision does not result in superficial burns and delayed wound healing. Moreover, diathermy incision is more efficient than scalpel incision with regard to incision time, incision blood loss, and postoperative wound pain and wound complications.

PATIENTS AND METHODS

This prospective study comprised of a randomised controlled trial that was conducted at Combined Military Hospital Kharian and Pakistan Airforce Hospital Mushaf between May 2008 and August 2011.

Ninety seven patients who underwent an elective, open cholecystectomy were recruited in the study. They were randomly divided into 2 groups. Randomization was done a night before surgery by an independent surgical colleague

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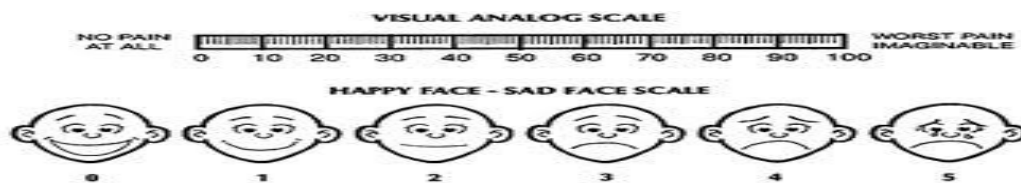
along with a written consent. Group I (n=48) underwent surgery by using diathermy in cutting mode for making skin incision and subsequent soft tissue dissection till the posterior-rectus

Diathermy in coagulation mode was used to secure hemostasis in both groups. Inclusion criteria comprised of all the patients of either sex, in adult age range (i.e. >18 years), who

Table-1: Statistical analysis of operative parameters.

| | Diathermy (n=48) | Scalpel (49) | p value |
|--------------------------------------|--------------------|--------------------|---------|
| Wound area cm ² | 20.41 (SD± 8.03) | 20.31 (SD± 8.77) | 0.03 |
| Incision time (sec) | 191.62 (SD± 20.43) | 256.36 (SD± 22.35) | 0.04 |
| Incision time (sec/cm ²) | 7.66 | 9.29 | 0.001 |
| Blood loss (ml) | 12.08 (± 1.06) | 15.46 (SD± 1.36) | 0.06 |
| Blood loss (ml/cm ²) | 1.48 | 2.08 | 0.03 |

Table-2: Post-operative pain score visual pain analogue.



| | Diathermy n=48 | Scalpel n=49 | p value |
|---------------------------------|----------------|----------------|---------|
| Day 1 of surgery | 4.35 SD=1.345 | 4.36 SD= 1.298 | 0.57 |
| Day 2 of surgery | 2.10 SD=0.984 | 2.20 SD=1.008 | 0.37 |
| Day3 of surgery | 0.73 SD=1.678 | 0.72 SD= 1.598 | 0.59 |
| Patient demand analgesia | | | |
| Volume (mg) | 75 | 80 | 0.98 |
| Days | 3 | 3 | 0.12 |

Table-3: Post operative wound healing and complications.

| | | Diathermy n=48 | Scalpel n=49 | p |
|--|--------------------------------------|----------------|--------------|------|
| Wound infection according to ASEPSIS Wound Scoring System (Adapted from Wilson et al, Lancet 1986) | Score 0-10=satisfactory healing. | 43 | 45 | 0.73 |
| | Score 11-20=disturbance of healing | 3 | 2 | 0.12 |
| | Score 21-30=minor wound infection | 2 | 2 | 0.33 |
| | Score 31-40=moderate wound infection | - | - | |
| Wound haematoma/seroma | | 2 | 2 | 0.64 |
| Wound dehiscence | | - | - | - |
| Wound healing (days) | | 14.44 | 14.80 | 0.58 |

sheath and peritoneum were fully opened. A monopolar diathermy using a pen/needle electrode and delivering 500 k-Hz of sinusoidal current was used in the procedure. Group II (n=49) underwent surgery by using steel scalpel for making skin and subcutaneous incision.

underwent elective open cholecystectomy. Patients on anti coagulant therapy, patients lost to follow up and those who refused consent for diathermy incision.

Open cholecystectomy was performed through a transverse sub-costal incision of about

4-6 cms. Exact length and depth of the incision was measured at the completion of surgery with a sterile tape. Prophylactic antibiotics (Ceftriaxone / Cefotaxime / Cefoperazone + salbactam) were administered at the time of induction and continued post operatively till 2nd post-operative day (i.e day 3)

Incision time was noted from the start of making skin incision till complete opening of posterior rectus sheath and peritoneum. Blood loss during this step of surgery was noted by using pre-weighed dry gauge packs. Wound was closed with vicryl 1, whereas, skin was closed with prolene 3/0. Post operative analgesia included Injection Nalbuphine HCl that was administered on patient demand. Injectable analgesics were continued till 2nd post operative day (i.e. day 3) when the demand was shifted to oral analgesics such as tramadol and diclofenac. Visual pain scoring (visual analog scale) was done each morning post operatively by an independent surgical team member till day 3.

Wound healing was classified on the basis of ASEPSIS Wound Scoring System as described by Wilson AP et al⁵. Category of infection: total score 0-10 = satisfactory healing; 11-20= disturbance of healing; 21-30 = minor wound infection; 31-40= moderate wound infection.

Post operative wound complications such as superficial burns, wound sepsis, dehiscence and hematoma/seroma formation were observed for 01 month. The stitches were removed on 9th post operative day. In case of infection wounds were dressed till they healed by secondary intention or delayed suturing. Final healing of the wound was noted at 01 month of follow-up.

SPSS version 16 was used for statistical analysis. Various mean values along with standard deviation were calculated. Unpaired Student's t test was used to assess the under observation patients parameters and operative parameters. A value of $p < 0.05$ was considered statistically significant.

RESULTS

Both the groups were similar in their demographic features. Mean age in diathermy group (n=48) was 40 years (range 26- 60; standard deviation: 23.154), whereas mean age in scalpel group (n=49) was 36 years (range 20- 60; standard deviation: 21.578). Female: male ratio in diathermy group was 40:8, whereas, in scalpel group it was 40:9. Statistically this difference was not significant ($p= 0.67$)

There was no significant difference between the two groups in respect of wound area cm² ($p=0.37$). Incision time as calculated by sec/cm² was significantly less in diathermy group (7.66 sec/cm²) than scalpel group (9.29 sec/cm²) $p = 0.001$ i.e. less time was required in opening the wound with diathermy than with scalpel.

Similarly wound related blood loss was less in diathermy group (1.48 ml/cm²) than in scalpel group (2.08 ml/cm²) $p= 0.03$.

There no statistical difference in pain perception and requirement of analgesics in either group on the day of surgery ($p=0.57$), on 2nd $p=0.37$ and 3rd day of surgery $p= 0.61$. The results have been given in table 1, 2 and 3.

No incidence of thermal injury occurred in diathermy group. Post operative wound complications did not differ in either group. There was no incidence of wound dehiscence in either group. On the basis of ASEPSIS wound scoring system, 3 wounds from diathermy group and 2 wounds from scalpel group fell in the score range of 11-20 (disturbance of healing), whereas, 2 wounds each from diathermy group and scalpel group fell in score range 21-30 (minor wound infection). These wounds were treated conservatively with wound dressings and wound toilet. All of them healed on conservative treatment with only three cases requiring secondary suturing. Wound hematoma / seroma occurred in two cases in each group, which were managed by repeated aspirations.

There was complete wound healing at 01 month follow-up in each group.

DISCUSSION

Since the improvement in electrosurgical equipments and advent of oscillatory units, diathermy has been excessively used for hemostasis and sub cuticle dissection. Its use for making skin incision has not gained generalized acceptance. Earlier studies conducted on animals revealed lateral thermal injuries with thermal knives that resulted in delayed wound healing when compared with standard steel scalpel^{1,2}.

Ji et al in 2006 studied the effect of high frequency surgical knives on healing of abdominal incision in rats. They discouraged the use of electrical knives including electrocautery for wound incision since it resulted in more wound infection rate and delayed healing². Similarly Ozgun et al in 2007 found harmonic scalpel less damaging than electrocautery in rats when performing midline laparotomy but cold scalpel was more superior to harmonic scalpel in causing less inflammatory reaction and necrosis⁶.

New oscillating units that deliver sinusoidal current via an electrode in cutting mode result in rapid cell vaporization along the tissue cleavage line thus minimizing damage to the surrounding area⁷. Therefore, in absence of tissue charring, there is less inflammation and minimal scarring, whereas, hemostasis is instantaneous.

Studies have demonstrated the safety of diathermy incision when compared to scalpel with no difference in terms of wound strength and wound infection^{3,8,9}. Cochrane data base Sp Rev. 2007 concluded that the use of diathermy approach to vas deferens resulted in less bleeding, hematoma, infection, pain and shorter operating time than traditional incision techniques. Although, both approaches did not differ in their effectiveness⁴.

Kearns et al in 2001 and Shamim in 2009 were able to establish the efficacy of diathermy incision as compared to scalpel incision. They found that diathermy incision resulted in less blood loss, less incision time with reduced need of post operative analgesics in diathermy group,

with no difference in post operative wound complications and scar formation^{10,11}.

Charoenkwank et al in their review could not establish the superiority of electrosurgical incision over scalpel but they did confirm that the use of electrosurgery in making abdominal skin incision is as safe as using scalpel¹². Another systematic review and meta-analysis revealed that electrocautery is safe and effective while making skin incision, as it significantly reduces incision time, incision blood loss and post-operative pain. Moreover, there was no significant difference in wound infection or scar cosmesis when compared to scalpel¹³.

Our own results are similar with other recently conducted review studies that clearly concluded less blood loss and quicker time with cutting diathermy while making skin incision than those made with scalpel. Whereas, there was no difference in post-operative pain or wound complication¹⁴.

Other studies have established the safety and efficacy of diathermy incision in the field of neurosurgery, thoracic surgery, orthopedic and maxillofacial cosmetic surgery¹⁴⁻¹⁶. Diathermy has been safely used in excising nevi and for shaving techniques that included partial thickness removal of superficial lesions such as hemangioma, pyogenic granulomas, etc, with good aesthetic results¹⁷.

Another added advantage of diathermy incision is the sense of security against percutaneous injury that has been a potential hazard of using scalpel in operative field¹⁸.

CONCLUSION

Diathermy is superior to scalpel in respect of quick incision time and less blood loss but it may not affect the overall outcome of the operation. Although, the choice of either method remains to rest with the surgeon preference but we advocate that electrocautery can safely be used to make skin incisions without fear of any superficial burns or delayed wound healing.

REFERENCES

1. Sowa DE, Masterson BJ, Nealon N, von Fraunhofer JA. Effects of thermal knives on wound healing. *Obstet Gynecol.* 1985; 66(3):436-9
2. Ji GW, Wu YZ, Wang X, Pan HX, Li P, Du WY et al. Experimental and clinical study of influence of high-frequency electric knives on healing of abdominal incision. *World J Gastroenterol.* 2006 Jul 7; 12(25):4082-5.
3. Chrysos E, Athanasakis E, Antonakakis S, Xynos E, Zoras O. A prospective study comparing diathermy and scalpel incisions in tension free inguinal hernioplasty. *Am Surg.* 2005; 71(41): 326-9.
4. Cook LA, Pun A, van Vliet H, Gallo MF, Lopez LM. Scalpel versus no scalpel incision for vasectomy. *Cochrane Database Syst Rev.* 2007 ;(2): CD004112.
5. Wison AP, Treasure T, Strurridge MF. A scoring method (ASEPSIS) for postoperative wound infection for use in clinical trials of antibiotic prophylaxis. *Lancet* 1986; i:311-3
6. Ozgun H, Tuncyurek P, Boylu S, Erpek H, Yenisey C, Kose H et al. The right method for midline laparotomy: what is the best choice for wound healing? *Acta Chir Belg.* 2007 Nov- Dec; 107(6):682-6.
7. Dixon AR, Watkin DFL, Electrosurgical skin incision versus conventional scalpel: a prospective trial. *J R Coll Surg Edinb* 1990; 77: 626-7.
8. Hemsell DL, Hemsell PG, Nobles B, Johnson ER, Little BB, Heard M. Abdominal wound problems after hysterectomy with electrocautery vs. scalpel subcutaneous incision. *Infect Dis Obstet Gynecol.* 1993;1(1):27-31.
9. Garcia A, Nascimento JE, Doral EM, Pimental RE, Curvo EA, Daud FO. Healing of abdominal wall aponeurosis of rats after incision with either cold scalpel or electrocautery. *Acta Cir Bras.* 2007 Mar-Apr;22 Suppl 1:12-5
10. Kearns SR, Connolly EM, McNally S, McNamara DA, Deasy J. Randomized clinical trial of diathermy versus scalpel incision in elective midline laparotomy. *Br J Surg* 2001 88:41-44.
11. S Muhammad. Diathermy versus scalpel skin incision in general surgery: double-blind, randomized, clinical trial. *World J Surg* 2009 33:1594-1599.
12. Charoenkwan K, Chotirosniramit N, Rerkasem K. Scalpel vs electrocautery for abdominal incision. *Cochrane database system Rev.* 2012 June 13;6 CD 005987
13. Aird LN, Brown CJ. Systematic review and meta-analysis of electrocautery versus scalpel for surgical skin incisions. *Am J Surg.* 2012 Aug; 204(2):216-21.
14. Ly J, Mittal A, Windsor J. Systematic review and meta-analysis of cutting diathermy versus scalpel for skin incision. *Br J Surg.* 2012 May; 99(5): 613-20.
15. Sheikh B. Safety and efficacy of electrocautery scalpel utilization for skin opening in neurosurgery. *Br J Neurosurg.* 2004 Jun; 18(3):268-72.
16. Stolz AJ, Schtznier J, Lischke R, Simonek J, Pafko P. Is Scalpel required to perform a thoracotomy? *Rozhl Chir.* 2004 Apr; 83(4):185.
17. Peterson A. The use of electrosurgery in reconstructive and cosmetic maxillofacial surgery. *Dent Clin North Am.* 1982 Oct; 26(4):799-823.
18. Hainer BL. Electrosurgery for skin. *Am Fam Physician.* 2002 Oct 1; 66(7): 1259-66.
19. Kaspar TA, Wagner RF Jr. Percutaneous injury during dermatological surgery. *J Am Acad Dermatol.* 1991 May; 24(5 Pt 1):756-9.