Electrocautery Versus Scalpel Scalp Skin Incisions

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Abstract

Background: Scalp skin incisions have routinely been performed with scalpel. Recently, there is a shift to electrocautery skin incision. But, questions about bad scars, wound healing and sequels on hair growth limits its popularity.

Aim of Study: The aim of current study was to compare the diathermy versus scalpel skin incision for elective cranial incisions with regards to post-operative pain, post-operative wound infection and wound healing and hair regrowth.

Patients and Methods: This prospective comparative study was conducted on 42 patients. 21 patients underwent diathermy incision (diathermy group) that was compared with 21 scalpel incision patients (scalpel group). Pain that was assessed by visual analogue scale, feasibility, postoperative infection rate and hair regrowth were assessed at 3 months postoperatively and compared between both groups.

Results: Electrocautery incisions were clearly easier with less bleeding and shorter operative time. Electraucautery showed significantly less post-operative pain ($p<0.05$). Post-operative infection rate, scar and hair regrowth showed comparable results in both the groups ($p>0.05$). No complication was reported with both techniques.

Conclusion: Diathermy scalp incisions are easier, faster, and less painful than scalpel incision with comparable results as regard scar and hair regrowth.

Key Words: Electrocautery – Scalpel – Scalp – Frontal sinus fracture.

Introduction

SURGICAL skin incisions are usually performed with scalpel that usually leads to skin bleeding that obscure the operating field increasing operative time. Diathermy represents an alternative that is mainly utilized for skin incision, tissue dissection and hemostasis [1]. However, questions about excess scars, wound healing and sequels on hair growth limits popularity of the diathermy scalp incisions [2,3]. Recent electrosurgical units can deliver pure sinusoidal currents improved its quality and safety to gain the advantages of proper hemostasis, rapid dissection, and less operative blood loss [4,5]. Few studies had compared electrocautery and scalpel incision in the scalp [6,7]. Taking consideration that in the scalp, hair growth is an important factor that should be considered.

Therefore, The aim of the current study was to compare the diathermy with scalpel skin incision for elective cranial incisions with regards to post-operative pain, post-operative wound infection, scar character and wound healing and hair regrowth.

Patients and Methods

Forty two patients were included in the current prospective study at Zagazig University Hospitals, Zagazig, Egypt in the period between January 2016 and September 2018. Patients who were randomly assigned to 2 equal groups; 21 patients underwent diathermy incision (diathermy group) that was compared with 21 scalpel incision patients (scalpel group). Informed written consents were obtained from the patients and approval from the Zagazig University review board (IRB) was taken. Patients with previous scalp scars or lacerations, immune-compromised patients, and patients with pacemaker device were excluded from the study. The following parameters (feasibility, operative time, post-operative pain, post-operative wound infection, scar character, wound healing and hair regrowth) were recorded, tabulated, and analyzed.

Operative technique:

All patients were performed under general anesthesia and the scalp was scrubbed and draped. In diathermy group, conventional electrocautery (Conmed Sabre 2400 electrocautery machine) was used. Active electrode was insulated throughout
its length to avoid unneeded heat effect except at its distal cutting edge. Cutting mode was used to incise the skin while coagulation mode completes other scalp layers up to pericardium. The standard diathermy blade tip was used. Bipolar electrocautery was used for hemostasis when needed. To avert the skin edges away during cutting, mild traction was applied to either side of the skin incision. Therefore, only the tip of the diathermy electrode came in contact with the proposed incision line, and did not retouch the skin edges, so preventing resultant charring of the tissues.

In scalpel group, scalpel was used to incise the skin and other scalp layers till the galea.

In all cases, after finishing surgery, the galea was closed with 3.0 vicryl sutures and the skin edges were opposed with staples. The staples were removed at the 7th postoperative day. Wound complications during the operation or up to 6 months follow-up were recorded. Wound infection was defined as the pus discharge from the wound [7]. The post-operative pain was evaluated at the 1st, 2nd and 3rd post-operative days at a fixed time utilizing the visual analogue scale that was represented by a straight line measuring 10 scoring, the extremes of which corresponded to no pain at lower end and worst pain at the higher end [8]. Operative time for incision was calculated from begin skin incision till reaching the galea.

Collected data were statistically compared using tests from the SPSS program version 17 (Chicago, Illinois, USA). \( p \)-value \( \leq 0.05 \) is considered significant.

**Results**

42 cranial scalp incisions was done; 21 by diathermy (18 males and 3 females) and 21 by scalpel (17 males and 4 females). The patients’ age ranged between 20-68 years. The mean age for diathermy group was 44.2\( \pm \)3.22 and the mean age for scalpel group was 42.7\( \pm \)3.04. Both groups were matched as regard age (\( p=0.1302 \)), sex (\( p=0.6792246 \)) and type of approach (\( p=0.92727973 \)) (Tables 1, 2). While in scalpel group, bleeding was significant and need skin clips to control, in diathermy group, little easily controllable bleeding or oozing were encountered and skin clips were not necessary. Pain score was significantly less in diathermy group (\( p<0.00001 \)) and in both group pain disappeared within two weeks after surgery. The mean operative time was significantly longer (16.7\( \pm \)0.637) for scalpel group than diathermy group (8.4\( \pm \)0.38, \( p<0.0001 \)) (Table 2). Wound scars were narrow without wound complication such as contracted wounds, hypertrophic scar after both group throughout 6 months postoperative follow-up. There was also no noticeable alopecia around the wound in both groups at 6 months postoperatively. No infection was detected in both groups. No wound complication such as necrosis or infection occurred.

<table>
<thead>
<tr>
<th>Table (1): Preoperative data for scalpel versus diathermy groups.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test</td>
</tr>
<tr>
<td>--------------------------------</td>
</tr>
<tr>
<td>Sex:</td>
</tr>
<tr>
<td>Male</td>
</tr>
<tr>
<td>Female</td>
</tr>
<tr>
<td>Age:</td>
</tr>
<tr>
<td>Range</td>
</tr>
<tr>
<td>Mean ( \pm ) SD</td>
</tr>
</tbody>
</table>

\( X^2 = \) Chi-square test. \( NS = \) Non-significant.
Table (2): Operative data for scalpel versus diathermy groups.

<table>
<thead>
<tr>
<th>Types of approach:</th>
<th>Scalpel group</th>
<th>Diathermy group</th>
<th>Test</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coronal</td>
<td>12 (50%)</td>
<td>13 (65%)</td>
<td>$X^2=0.151$</td>
<td>0.92727973 NS</td>
</tr>
<tr>
<td>Pterional</td>
<td>5 (35%)</td>
<td>4 (15%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retrosigmoid</td>
<td>4 (15%)</td>
<td>4 (15%)</td>
<td></td>
<td></td>
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</table>

Postoperative pain:

<table>
<thead>
<tr>
<th>Median pain scale</th>
<th>Scalpel</th>
<th>Diathermy</th>
<th>Z-score</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>5 (85%)</td>
<td>3 (80%)</td>
<td>$Z=51.2790$</td>
<td>&lt;0.0001 S</td>
</tr>
<tr>
<td>Range</td>
<td>10-19</td>
<td>5-11</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$X^2$=Chi-square test, Z-score for Mann-Whitney U. NS=Non-significant. S=Significant.

Discussion

The surgical use of electrocautery dates back to 1909 [9] later, in 1926, it was used in neurosurgery [10]. The reluctance to incise skin with electrocautery is partly attributable to concerns about the possible excessive scarring and poor wound healing. However, recently no difference was reported in wound complications between the cold scalpel and electrocautery [7].

Modern electrocautery equipment as that used in the current study that is commonly used nowadays in surgery has cutting and coagulation modes. Cutting mode produces a continuous output, while coagulation mode involves a pulsed output. The blend facility only functions when in cutting mode and allows a combination of cutting and coagulation to increase the haemostasis degree during cutting [8].

Several studies have investigated electrocautery skin incision mainly for abdominal or thoracic skin incisions that proved to be safely effective [11,12]. However very few studies were undertaken on diathermy usage in the scalp incision with no previous comparative study between cold scalpel and diathermy with its conventional electrode tip for scalp incisions was performed in cranial approaches.

In the current study, we did this comparative prospective study. We found that electrocautery did not increase the incidence of indurated wound margins, infection, and weakness of the wound cut and did not lead to wider peri-incisional alopecia area compared with the cold scalpel. It had been assumed that local tissue diathermy heating elevates the oxygen tension in the subcutaneous tissue, so improving wound resistance to infection [13]. Moreover, we suggested that this increase oxygen tension will also help to enhance hair follicle support and support proper wound healing.

In addition, time taken during was significantly shorter and blood loss was less using diathermy than cold scalpel. We insured that following the well-known guidelines for use the electrocautery [14] is a must for safety of diathermy usage. The shorter operative time on diathermy use is mainly due to it hemostatic cutting with minimal bleeding and non-obscured operative field and no need for use of clips in the wound edges.

Thus, Electrocautery skin incision is safe procedure and effective with advantages of less operation times, little blood loss from the edges of skin incision and possible avoidance of skin edge necrosis or alopecia caused by skin clips. Therefore we recommend electrocautery skin incision for cranial approach and still investigation of its use in patients who supposed to have healing problem such as diabetic patients is needed.

Conclusion:

Diathermy scalp incisions are easier, faster, and less painful than scalpel incision with comparable results as regard scar and hair regrowth.

Compliance with ethical standards:

- Funding: No funding received.
- Conflict of Interest: The authors declare no conflict of interest.
- Ethical approval: Approval from the Zagazig University review board (IRB) was taken and all procedures performed in studies were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments.
- Informed consent: Informed written consents were obtained from the included patients.

References

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