Original Article

Reconstruction of Scalp Defects: A Meta-Analysis Study

Abdallallah Mohamed Abdelaziz Ali 1, Moustafa Sayed Ahmed 2, Ahmed Moustafa Omran 1

1 Department of Plastic Surgery, Damietta Faculty of Medicine, Al-Azhar University, Damietta, Egypt
2 Department of Plastic Surgery, Faculty of Medicine, Al-Azhar University, Cairo, Egypt

ABSTRACT

Background: Scalp deficiencies can be caused by a number of different etiological reasons, including tumor extirpation, infection, burns, or trauma to this special region of the human body. The scalp can be reconstructed in a number of ways, including through primary closure, skin grafting, local flaps, tissue expansion, or free tissue transfer.

Aim of the work: To evaluate the various methods utilized for reconstructing scalp deformities; to get better surgical choice, through meta-analysis regarding defect size, depth, location, hairline, alopecia risk and aesthetic appearance.

Patients and Methods: Recent clinical trials or cluster trials, as well as retrospective compared cohort studies, were included in this Meta-analysis. Study was conducted on human subjects with reconstruction of scalp defects. Review of the Methods Used in Reconstructing Scalp Defects; to get better surgical choice, through meta-analysis regarding defect size, depth, location, hairline, alopecia risk and aesthetic appearance.

Results: A total of 393 cases had complete healing as regard complications founded in form of Hematoma in 18 cases, infection in 4 cases, seroma in 3 cases, wound dehiscence in 63 cases, Distal flap necrosis in 1 case, Partial flap loss in 13 cases, total Graft loss in 13 cases.

Conclusion: Using local flaps to repair scalp abnormalities is a straightforward operation that does not often require extensive postoperative care and can be completed in a short amount of time with minimal risk. A local scalp flap is the preferred method for reconstructing even a big and complex scalp defect, such as one that involves the cranium or the dura. Our findings suggest that problems from local axial flap applications were infrequent and did not significantly impact flap survival.

Keywords: Scalp reconstruction; Tissue expanders; Local flaps.

This is an open-access article registered under the Creative Commons, ShareAlike 4.0 International license [CC BY-SA 4.0] [https://creativecommons.org/licenses/by-sa/4.0/legalcode.]
INTRODUCTION

The scalp is an integral part of the body, serving to insulate the brain from the environment by covering the skull bones. Its hair-bearing structure is both functional and aesthetically significant. Poor quality of life, alopecia, and deformities can arise from deformities to this structure brought on by trauma, burns, radiation, or the removal of a tumor [1].

Several surgical algorithms have been devised and used for the treatment of scalp abnormalities [2]. 1. Primary closure: when dealing with minor defects, this is the first surgical option to take [3]. 2. Skin graft: are not frequently option one for scalp restorations as they can result in poor cosmetic outcomes such as alopecia, color mismatch, and height difference. Nonetheless, if a well-vascularized tissue bed persists, a skin graft may be considered as a viable alternative in some circumstances [4]. 3. Local flap: in terms of surgical options, it is the gold standard for repairing holes in the scalp. Beneficial when health is low, as while undergoing radiation [1]. 4. Regional flap: A vascularized flap is used to cover a defect in the scalp after the vascular pedicle has been dissected. Surgical excision is a common method for treating significant abnormalities in the scalp. Several variants exist, including the temporoparietal fascia flap [5]. 5. Tissue expander: Patients with post-surgical scalp baldness should seriously consider this surgery [6]. 6. Drilling of the diplopic space and skin grafting: The outer table of the skull can be drilled to access the diplopic area. By regularly changing the dressings, we encourage the formation of granulation tissues, which eventually creep to coat the outer table bones. The granulation tissues will be covered with skin grafts during a second procedure [7, 8]. 7. Free flap from remote zones in wide scalp defect, all of these previous techniques were used with different algorithms, advantages and disadvantages of every technique through scattered publication [2].

PATIENTS AND METHODS

This meta-analysis study aimed to investigate different interventions for scalp defects reconstruction. The study included recent clinical trials, cluster trials, prospective and retrospective comparative cohort studies. The search strategy involved using databases such as PubMed, Cochrane, PLOS, and Web of Science, as well as the Egyptian Knowledge Bank. The search terms used were related to "scalp," "reconstruction," "treatment," "management," and "plastic surgery." Only studies published in English within the last five years were included.

The search results underwent manual screening for eligibility based on the inclusion and exclusion criteria. After screening, 15 studies were included in the meta-analysis. Ethical approval was obtained from the committee of Al-Azhar University. The study aimed to analyze different techniques used for scalp defects reconstruction, taking into consideration factors such as defect size, depth, location, hairline, and alopecia risk.

The screening process involved removing duplicate citations and conducting title and abstract screening, followed by full-text screening. The data from the included trials were combined using systematic review management software. The Cochrane collaboration tool for assessing the risk of bias was used to evaluate the possible risk of bias in each study. Data extraction involved using a standardized Excel sheet, and reviewers independently extracted data from the included studies.

In total, 3828 titles were initially identified, leading to the selection of 15 studies for inclusion in the final database. Among the included studies, 12 were retrospective studies, and 3 were case report studies. The statistical analysis was conducted using MedCalc software, with confidence intervals and p-values used to determine statistical significance. The study characteristics extracted included study identification, methods and inclusion criteria, study procedures, and outcome measures used.

RESULTS

Study characteristics: 12 study were retrospective studies; 3 studies were case report studies as 517 cases were included with mean age was 55.9 years

Regarding Type of reconstruction, musculo-cutaneous latissimus dorsi [LD], LD muscle, free anterolateral thigh [ALT], vastus lateralis muscle, and rectus abdominis muscle were all used in the various reconstructions performed. Omental flap, 2-staged reconstruction with an initial peri-cranial flap and dermal substitute placement followed by the placement of a split-
thickness skin graft, acellular dermal matrix, split-thickness skin graft, full-thickness skin graft, dermal wound matrix, local tissue rearrangement, free flap, titanium mesh exposure, fascio-cutaneous flap, smooth rectangular tissue expander, serratus anterior muscle flap, parascapular flap, flap with STSG, rotation advancement flap, double hatchet flap, bipedicle flap and double transposition.

Outcome and complication: A total of 393 cases had complete healing as regard complications founded in form of hematoma in 18 cases, infection in 4 cases, seroma in 3 cases, wound dehiscence in 63 cases, distal flap necrosis in 1 case, Partial flap loss in 13 cases, total Graft loss in 13 cases. Skin necrosis founded in 4 cases, flap congestion in 1 case, Donor site morbidity in 8 cases and Revision surgery in 36 cases.

Meta-analysis

Fifteen studies showing healing rate with total event rate 86.495% with significant heterogeneity between studies as shown in table [1], three studies showing hematoma with total number 124, with insignificant heterogeneity between studies as shown in table [2], three studies showing Infection rate with total event rate 3.876 with insignificant heterogeneity between studies as shown in figure [1], two studies showing seroma rate with total event rate 8.545 with insignificant heterogeneity between studies as shown in figure [2].

Regarding wound, 10 studies showing wound dehiscence with total event rate 13.839 with insignificant heterogeneity between studies as shown in table [3].

As regard flap loss, seven studies showing partial flap loss with total event rate 9.010 with insignificant heterogeneity between studies as shown in table [4]; eight studies showing total graft loss with total event rate 7.323 with significant heterogeneity between studies table [5], and two studies showing donor site morbidity with total event rate 19.869 with significant heterogeneity between studies as shown in figures [3]; five studies showing Revision surgery with total event rate 16.128 with insignificant heterogeneity between studies as shown in table [6].

Table [1]: Meta-analysis for healing

<table>
<thead>
<tr>
<th>Study</th>
<th>Total number</th>
<th>Event</th>
<th>Event rate [%]</th>
<th>95% CI of rate [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bas et al. [5]</td>
<td>14</td>
<td>14</td>
<td>100.0</td>
<td>76.840 – 100.0</td>
</tr>
<tr>
<td>Del Castillo et al. [9]</td>
<td>30</td>
<td>30</td>
<td>100.0</td>
<td>88.430 – 100.0</td>
</tr>
<tr>
<td>Chaiyasate et al. [10]</td>
<td>13</td>
<td>13</td>
<td>100.0</td>
<td>75.295 – 100.0</td>
</tr>
<tr>
<td>Tecce et al. [13]</td>
<td>189</td>
<td>164</td>
<td>86.772</td>
<td>81.096 – 91.25</td>
</tr>
<tr>
<td>Chen et al. [14]</td>
<td>8</td>
<td>8</td>
<td>100.0</td>
<td>63.058 – 100.0</td>
</tr>
<tr>
<td>Shin et al. [15]</td>
<td>2</td>
<td>2</td>
<td>100.0</td>
<td>15.811 – 100.0</td>
</tr>
<tr>
<td>Ehrl et al. [16]</td>
<td>38</td>
<td>34</td>
<td>89.474</td>
<td>75.195 – 97.06</td>
</tr>
<tr>
<td>Gupta and Srivastava [17]</td>
<td>54</td>
<td>54</td>
<td>100.0</td>
<td>93.397 – 100.00</td>
</tr>
<tr>
<td>Zhou et al. [18]</td>
<td>1</td>
<td>1</td>
<td>100.0</td>
<td>2.500 – 100.0</td>
</tr>
<tr>
<td>Weitz et al. [19]</td>
<td>17</td>
<td>15</td>
<td>88.235</td>
<td>63.559 – 98.54</td>
</tr>
<tr>
<td>Wolff et al. [20]</td>
<td>33</td>
<td>31</td>
<td>93.939</td>
<td>79.774 – 99.26</td>
</tr>
<tr>
<td>Kim et al. [21]</td>
<td>1</td>
<td>0</td>
<td>0.0</td>
<td>0.000 – 97.50</td>
</tr>
<tr>
<td>Lamaris et al. [22]</td>
<td>14</td>
<td>13</td>
<td>92.857</td>
<td>66.132 – 99.82</td>
</tr>
<tr>
<td>Total [fixed effects]</td>
<td>517</td>
<td></td>
<td>79.548</td>
<td>75.867 – 82.90</td>
</tr>
<tr>
<td>Total [random effects]</td>
<td>517</td>
<td></td>
<td>86.495</td>
<td>66.611 – 98.15</td>
</tr>
</tbody>
</table>

Test for heterogeneity

| Q         | 356.8123 |
| DF        | 14       |
| Significance level | P <0.0001* |
| I² [inconsistency] | 96.08% |
| 95% CI for I² | 94.73 – 97.08 |

Q: Total variance for heterogeneity; I²: Observed variance for heterogeneity; CI: Confidence interval [LL: Lower limit – UL: Upper Limit]
Table [2]: Meta-analysis for Hematoma

<table>
<thead>
<tr>
<th>Study</th>
<th>Total number</th>
<th>Event</th>
<th>Event rate [%] [Proportion]</th>
<th>95% CI of rate [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chaiyasate et al. [10]</td>
<td>13</td>
<td>1</td>
<td>7.692</td>
<td>0.195–36.030</td>
</tr>
<tr>
<td>Weitz et al. [19]</td>
<td>17</td>
<td>2</td>
<td>11.765</td>
<td>1.458–36.441</td>
</tr>
<tr>
<td>Total [fixed effects]</td>
<td>124</td>
<td></td>
<td>9.487–22.701</td>
<td></td>
</tr>
<tr>
<td>Total [random effects]</td>
<td>124</td>
<td></td>
<td>9.552–21.993</td>
<td></td>
</tr>
</tbody>
</table>

Test for heterogeneity

<table>
<thead>
<tr>
<th>Q</th>
<th>0.4037</th>
</tr>
</thead>
<tbody>
<tr>
<td>DF</td>
<td>2</td>
</tr>
<tr>
<td>Significance level</td>
<td>P = 0.8172</td>
</tr>
<tr>
<td>I² [inconsistency]</td>
<td>0.00%</td>
</tr>
<tr>
<td>95% CI for I²</td>
<td>0.0 –83.38</td>
</tr>
</tbody>
</table>

Figure [1]: Forest plot for infection

Figure [2]: Forest plot for seroma
Table [3]: Meta-analysis for wound dehiscence

<table>
<thead>
<tr>
<th>Study</th>
<th>Total number</th>
<th>Event</th>
<th>Event rate [%] [Proportion]</th>
<th>95% CI of rate [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bas et al. [5]</td>
<td>14</td>
<td>1</td>
<td>7.143</td>
<td>0.181 – 33.868</td>
</tr>
<tr>
<td>Del Castillo et al. [9]</td>
<td>30</td>
<td>2</td>
<td>6.667</td>
<td>0.818 – 22.074</td>
</tr>
<tr>
<td>Jang et al. [12]</td>
<td>94</td>
<td>1</td>
<td>1.064</td>
<td>0.0269 – 5.785</td>
</tr>
<tr>
<td>Chen et al. [14]</td>
<td>8</td>
<td>2</td>
<td>25.000</td>
<td>3.185 – 65.086</td>
</tr>
<tr>
<td>Gupta and Srivastava [17]</td>
<td>54</td>
<td>2</td>
<td>3.704</td>
<td>0.452 – 12.747</td>
</tr>
<tr>
<td>Zhou et al. [18]</td>
<td>1</td>
<td>1</td>
<td>100</td>
<td>2.500 – 100.0</td>
</tr>
<tr>
<td>Weitz et al. [19]</td>
<td>17</td>
<td>2</td>
<td>11.765</td>
<td>1.458 – 36.441</td>
</tr>
<tr>
<td>Lamaris et al. [22]</td>
<td>14</td>
<td>3</td>
<td>21.429</td>
<td>4.658 – 50.798</td>
</tr>
<tr>
<td>Total [fixed effects]</td>
<td>430</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total [random effects]</td>
<td>430</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Test for heterogeneity

<table>
<thead>
<tr>
<th>Q</th>
<th>56.2468</th>
</tr>
</thead>
<tbody>
<tr>
<td>DF</td>
<td></td>
</tr>
<tr>
<td>Significance level</td>
<td>P &lt; 0.0001*</td>
</tr>
<tr>
<td>$I^2$ [inconsistency]</td>
<td>84.0%</td>
</tr>
<tr>
<td>95% CI for $I^2$</td>
<td>72.15 – 90.81</td>
</tr>
</tbody>
</table>

Table [4]: Meta-analysis for Partial flap loss

<table>
<thead>
<tr>
<th>Study</th>
<th>Total number</th>
<th>Event</th>
<th>Event rate [%] [Proportion]</th>
<th>95% CI of rate [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bas et al. [5]</td>
<td>14</td>
<td>1</td>
<td>7.143</td>
<td>0.181 – 33.868</td>
</tr>
<tr>
<td>Chaiyasate et al. [10]</td>
<td>13</td>
<td>1</td>
<td>7.692</td>
<td>0.195 – 36.030</td>
</tr>
<tr>
<td>Ehrl et al. [16]</td>
<td>38</td>
<td>3</td>
<td>7.895</td>
<td>1.659 – 21.377</td>
</tr>
<tr>
<td>Gupta and Srivastava [17]</td>
<td>54</td>
<td>2</td>
<td>3.704</td>
<td>0.452 – 12.747</td>
</tr>
<tr>
<td>Zhou et al. [18]</td>
<td>1</td>
<td>0</td>
<td>0.000</td>
<td>0.000 – 97.50</td>
</tr>
<tr>
<td>Lamaris et al. [22]</td>
<td>14</td>
<td>2</td>
<td>14.286</td>
<td>1.779 – 42.813</td>
</tr>
<tr>
<td>Total [fixed effects]</td>
<td>164</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total [random effects]</td>
<td>164</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Test for heterogeneity

<table>
<thead>
<tr>
<th>Q</th>
<th>3.6128</th>
</tr>
</thead>
<tbody>
<tr>
<td>DF</td>
<td></td>
</tr>
<tr>
<td>Significance level</td>
<td>P = 0.728</td>
</tr>
<tr>
<td>$I^2$ [inconsistency]</td>
<td>0.0%</td>
</tr>
<tr>
<td>95% CI for $I^2$</td>
<td>0.00 – 52.32</td>
</tr>
</tbody>
</table>

Table [5]: Meta-analysis for total Graft loss

<table>
<thead>
<tr>
<th>Study</th>
<th>Total number</th>
<th>Event</th>
<th>Event rate [%] [Proportion]</th>
<th>95% CI of rate [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jang et al. [12]</td>
<td>94</td>
<td>3</td>
<td>3.191</td>
<td>0.663 – 9.045</td>
</tr>
<tr>
<td>Ehrl et al. [16]</td>
<td>38</td>
<td>4</td>
<td>10.526</td>
<td>2.943 – 24.805</td>
</tr>
<tr>
<td>Gupta and Srivastava [17]</td>
<td>54</td>
<td>0</td>
<td>0.000</td>
<td>0.000 – 6.603</td>
</tr>
<tr>
<td>Zhou et al. [18]</td>
<td>1</td>
<td>0</td>
<td>0.000</td>
<td>0.000 – 97.50</td>
</tr>
<tr>
<td>Weitz et al. [19]</td>
<td>17</td>
<td>2</td>
<td>11.765</td>
<td>1.458 – 36.441</td>
</tr>
<tr>
<td>Wolff et al. [20]</td>
<td>33</td>
<td>2</td>
<td>6.061</td>
<td>0.743 – 20.226</td>
</tr>
<tr>
<td>Kim et al. [21]</td>
<td>1</td>
<td>1</td>
<td>100.0</td>
<td>2.500 – 100.00</td>
</tr>
<tr>
<td>Lamaris et al. [22]</td>
<td>14</td>
<td>1</td>
<td>7.143</td>
<td>0.181 – 33.868</td>
</tr>
<tr>
<td>Total [fixed effects]</td>
<td>252</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total [random effects]</td>
<td>252</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Test for heterogeneity

<table>
<thead>
<tr>
<th>Q</th>
<th>18.1727</th>
</tr>
</thead>
<tbody>
<tr>
<td>DF</td>
<td></td>
</tr>
<tr>
<td>Significance level</td>
<td>P = 0.011*</td>
</tr>
<tr>
<td>$I^2$ [inconsistency]</td>
<td>61.48%</td>
</tr>
<tr>
<td>95% CI for $I^2$</td>
<td>16.67 – 82.19</td>
</tr>
</tbody>
</table>
DISCUSSION

Scalp defects may occur following trauma, radiotherapy, oncologic resection, and recurrent surgeries. The hair-bearing scalp has a dual role, which consists of protecting the calvarium and contributing to esthetic appearance, while the "reconstructive ladder" approach may be used to close small and medium-sized scalp defects, it is not the case for larger ones involving the calvarium or with a radiation therapy history [23].

Hair follicles and the inelastic nature of the scalp make rebuilding difficult. Because of the significant impact this area has on people's overall aesthetic, cosmetic concerns are equally relevant. When reconstructing the scalp, local flaps are preferred wherever possible since they make use of the patient's own tissue and, hence, are more likely to produce a natural appearance; this is especially important when dealing with hair-bearing tissue. Patients with lesions bigger than 50 cm² or requiring significant undermining may find the use of local flaps to be impractical, and cicatricial alopecia can result from an overuse of tension [24].

The primary focus of this research was to analyze the different techniques used for reconstruction of scalp defects; to get better surgical choice, through meta-analysis regarding defect size, depth, location, hair line, alopecia risk and aesthetic appearance.

This meta-analysis involved 15 studies, including 517 patients of 12 retrospective studies [5, 8-14, 16, 17, 19, 20, 22] and three case report studies [15, 18, 21].

The current meta-analysis included 517 patients with mean age of 59.94 years. There were 330 males and 187 females.
The meta-analysis by Goel et al. [25] showed that the majority of patients with head tumors need scalp defect reconstructions were males.

The current study showed that most of the studied patients have scalp defect due to scalp malignancy at different sites of the head including temporoparietal, frontoparietal, fronto-temporo-parietal, parieto-occipital, temporal and Orbitofrontal.

Regarding defect size, the pooled data showed that the mean defect size was 93.614 mm and ranged from 12 mm as reported by Weitz et al. [19] to 230 mm as reported by Chaiyasate et al. [10]. Regarding depth it was found that the majority of the studied cases have skin and bony defect.

Regarding surgical method of reconstruction, Bas et al. [8] used flaps musculocutaneous latissimus dorsi [LD] in 4 cases, LD muscle in 3 cases, anterolateral thigh [ALT] in 4 cases, musculocutaneous ALT in one case, vastus lateralis muscle in one case, and rectus abdominis muscle in one case.

Gupta and Srivastava [17] used trans-position flap in 36 cases, Rotation advancement flap in 11 cases, double hatchet flap in 2 cases, bipedicle flap in 2 cases, double transposition in 3 cases.

Lamaris et al. [22] used ALT free flap in all his studied 14 cases.

The previous data indicated that there was a variety of surgical techniques can be used in scalp defect reconstruction, the selection of appropriate technique was determined by the size, depth and the localization of flaw.

The simplest method should always be tried as the starting point in surgery. However, in the case of extensive lesions without pericranium, healing by secondary intention is not an option for mending the scalp. Any later radiotherapy should not compromise the ideal reconstructive approach, which should be sufficient to cover the defect with the appropriate tension in the shortest amount of time possible during surgery. It's crucial that reconstructive surgery be well-vascularized, waterproof, and able to ward off infection [26].

As regard healing rate, the pooled analysis of the included studies showed that the mean healing rate was 86.495%. Healing was reported by 15 studies [5, 9-22] with major heterogeneity between studies.

In the current meta-analysis pooled data showed that the overall complication rate was 120/517 [23.2%] patients the most common complication was wound dehiscence, hematoma, total graft loss and flap loss.

Regarding Wound dehiscence; 10 studies [5, 9, 11-14, 17-19, 22] showed that the total event rate 13.839% with insignificant heterogeneity between studies.

Also, 7 studies [5, 9, 10, 16-18, 22] reported Partial flap loss with total event rate 9.010% with insignificant heterogeneity between studies.

Moreover, 8 studies [12, 16-22] reported total graft loss with total event rate 7.323% with significant heterogeneity between studies.

In the current meta-analysis 3 studies [10, 12, 19] have reported Hematoma with total number 18 with insignificant heterogeneity between studies.

Also, 3 studies [12, 19, 22] showing Infection rate with total event rate 3.876% with insignificant heterogeneity between studies.

As well, regarding seroma, the pooled data of 2 studies [5, 9] showed that the seroma rate was 8.545% with insignificant heterogeneity between studies.

Furthermore, 2 studies [16, 22] reported donor site morbidity with total event rate 19.869% with significant heterogeneity between studies.

The minimum complications rate was reported by Wolff et al. [28] who used full-thickness skin grafts in all 33 cases with 6% complications followed by Gupta and Srivastava [17] who used Transposition flap in 36 cases, Rotation advancement flap in 11 cases, Double hatchet flap in 2 cases, Bipedicle flap in 2 cases, Double transposition in 3 cases with 9.3% complications.

In the current meta-analysis pooled data of 5 studies [11, 13, 16, 19, 21] reported the need for revision surgery with total event rate 16.128 with insignificant heterogeneity between studies.

The maximum rate of revision surgery was 18.4% as reported by Ehril et al. [16] who used transposition flap in their studied cases.
In the current meta-analysis pooled data of 8 studies \cite{13-19,21} reported mortality with total event rate 9.195 with significant heterogeneity between studies.

The maximum rate of mortality was 24.9\% as reported by Tecce et al. \cite{13} followed by Weitz et al. \cite{19} who reported a rate of 5.9\%.

Moreover, Ehrl et al. \cite{16} revealed that there was no correlation between re-operation rates or wound problems and age, sex, comorbidities, histological diagnosis, recurrence history, postoperative radiation, chemotherapy, or reconstructive modality. On multivariate analysis, preoperative radiation was a significant predictor of death [OR, 3.34; 95\% CI, 1.2-9.7; \textit{p} = 0.022], as was immunosuppressed status [OR, 2.88; 95\% CI, 1.2-7.1; \textit{p}= 0.021].

**Conclusion:** Local flap reconstruction of scalp abnormalities is a simple, quick, and low-risk technique that often requires no particular care afterward. The local scalp flap is the preferred form of reconstruction for even the largest and most intricate scalp defects, such as those involving the skull or dura. The findings of local axial flap applications show that problems occurred seldom and did not significantly reduce flap survival. To corroborate findings and uncover risk factors of adverse events, additional prospective comparison studies are required with bigger sample size and longer follow up.

**Conflict of Interest and Financial Disclosure:** None.

**REFERENCES**


https://ijma.journals.ekb.eg/
Print ISSN: 2636-4174
Online ISSN: 2682-3780