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Endoscopic Versus Upper Eyelid Approaches for Excision of Pediatric External Angular Dermoid Cysts: A Prospective Cohort Study

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Abstract

Background: The treatment of external angular dermoid cysts is surgical excision through the direct surgical approach, the upper eyelid crease approach, or the endoscopic approach which uses hidden scalp incision to avoid facial scar. This study aimed to study and compare the surgical and cosmetic outcomes between endoscopic approach and upper eyelid crease approach and to determine which is better for such cases.

Methods: A prospective cohort study included 40 selected children with external angular dermoid cysts. Patients were randomly allocated into two groups; Group 1: treated by endoscopic approach and Group 2: treated by upper eyelid crease approach. Operative time, intraoperative complications, hospital stay and postoperative complications were evaluated. Cosmetic outcomes were assessed by both patients' parents and surgeons. Data were analyzed to determine which approach is better.

Results: the operative time and hospital stay were higher in group-1, with a highly significant result (p = 0.0001). Postoperative complications were also significantly higher in group-1 (p = 0.04). Cosmetic evaluation by surgeons was better in group-1, though not statistically significant (p-value 0.09). Cosmetic evaluation by parents was significantly better in group-1 (p-value 0.04).

Conclusions: The upper eyelid crease approach is much better than the endoscopic approach. It is a versatile, technically simple, cost-efficient approach that allowed excision of external angular dermoid cysts some distance away from the incision with low complication rates and high esthetic success rates. Although endoscopic approach has better cosmetic outcomes, we recommend upper eyelid crease approach for external angular dermoid cyst excision.

Keywords: External Angular Dermoid Cysts; Endoscopic Approach; Upper Eyelid Crease Approach; Cosmetic Outcome

Introduction

External Angular Dermoid Cysts (EADCs) are common pediatric craniofacial congenital swellings that arise along the embryonic fusion lines during the second month of embryogenesis [1]. They commonly exist next to the external third of the eyebrow, though they may occur above the eyebrow, in the temporal or frontal regions superior or opposite the lacrimal gland [2]. 40% of cases are diagnosed at birth and 60% are detected during the first five years EADCs typically manifest as a well-circumscribed, slowly growing swellings that adhere to the underlying structures. They may remain stable or rarely regress in size [3].

The diagnosis of simple, well-moving cysts can be made without further investigation [4]., but cysts adherent to the deeper structures and/or located higher, require an ultrasound and a radiography to confirm the diagnosis and detect intraosseous or trans-osseous extension. Magnetic Resonance Imaging (MRI) is indicated it is a suspicion of trans-osseous extension [5].

Complete surgical excision is the standard treatment. It is performed to avoid the complications such as infection, bone deformity, esthetic disability and intracranial extension. The conventional surgical approach exposes the cyst through a direct incision over the cyst or masked above, below, or through the eyebrow. The Upper Eyelid Crease Approach (UECA) is an alternative which uses

an incision in the natural upper eyelid crease to avoid scar and frontal nerve paralysis [6-8]. The Endoscopic Approach (EA) was introduced as a minimally invasive technique to reduce the facial scar through a hidden scalp incision [9, 10].

Even though the techniques for excision of EADCs have been described in literature, very little research has been conducted to compare EA to UECA, therefore, this study was performed to compare the cosmetic and the surgical outcomes (operative time, length of hospital stays, intraoperative and postoperative complications) between EV and the UECA in a cohort of patients with EADCs and to determine which surgical approach has better outcomes.

Materials and Methods

A prospective cohort study was done at the authors' departments, between January 2016 and December 2019. It included all cases of EADCs who presented and were treated by either EA or UECA for excision of the cyst.

The Inclusion criteria for the study were: the patient age was not more than 12 years, the cyst was simple, superficial, and the postoperative pathology report confirmed dermoid cyst. The Exclusion criteria were complicated cysts, cysts with orbital repercussions, intraosseous, or intracranial extension and where the guardian refused participation in the study and / or signing an informed consent.

This study was approved by Review Board and Ethics Committee (IBR) of Sohag Faculty of Medicine, and was performed in accordance with the principles of the Declaration of Helsinki. Parents / legal guardians of all cases signed a written informed consent.

The study sample size was determined to be 40 cases, keeping the confidence interval at 95%. Patients were randomly divided into two groups. An open-source software was used for these purposes. Twenty had undergone treatment by EA, and twenty had undergone treatment UECA. They were labelled as Group 1 and Group 2 respectively for the ease of statistical analysis.

The patients were evaluated in terms of age, gender, size and location of lesion, treatment, outcome and complications. The operative time, intraoperative complications, and hospital stay were also recorded and analyzed. All patients were operated under general anesthesia by the same team of surgeons with adequate clinical and surgical experience.

Endoscopic approach

A single port approach was employed through a 1.5-2 cm scalp incision in the temporal region 2 cm behind the hairline which was extended down to the subgaleal plane. Dissection proceeded in the subgaleal plane towards the cyst, then the endoscope was introduced in the created space, which was directly on the periosteum or deep temporalis fascia to avoid injury to the frontal branch of the facial nerve. Endoscopic dissection continued until the cyst was completely freed from the surrounding tissues and the underlying periosteum using microscissors and periosteal elevator. The cyst should be removed intact. The space was irrigated with normal saline and the incision was anatomically repaired. The endoscopic equipment involved a 6-mm 30° endoscope, a xenon light source, and a video camera with a monitor.

Upper Eyelid Crease Incision Approach (UECA)

A 1.5 to 2 cm incision was performed along the upper eyelid crease, ending distally opposite the lateral canthus. Sharp dissection was done through the palpebral part of the orbicularis oculi muscle until the suborbicular facial plane. The flap was retracted superolateral, and the cyst was displaced inferomedial to expose the cyst. The cyst was carefully grasped with a non-toothed forceps and was dissected from the surrounding tissues and the underlying peri-ostium using blunt and sharp dissection. The excised cyst was removed and hemostasis was achieved using bipolar diathermy. The orbicularis oculi muscle was approximated by two 5-0 polyglactin (Vicryl) sutures. Then, the skin was closed with a continuous subcuticular suture.

Postoperatively, the excised cyst was sent for histopathological examination. All patients received acetaminophen and amoxicillin orally. After recovery, all cases were examined for frontal nerve function. The patients were discharged and instructed to review the hospital if they developed complications such as swelling, wounds dehiscence or infection. Sutures were removed on the 5th postoperative day.

All Cases were asked for regular follow up with the last visit between 8th and 10th months after surgery for cosmetic evaluation of their scars. Two different surgeons with similar experience in operating such cases and two parents/legal guardians scored the esthetic outcome of the scars on a Visual Analog Scale (VAS). The evaluating surgeons differed from the operating surgeons to eliminate any bias. They were completely blinded to the study and were nowhere related to it. The VAS is a 100-mm line, with 0 representing the worst esthetic result possible and 100 representing the best possible outcome. All the patients had regularly reported for follow-up.

The distribution, proportion, descriptive statistics, and surgical criteria were considered. Values were quoted as Mean ± Standard Deviation. Shapiro-Wilk test was used to determine the normality of the groups pre-operatively. Student's *t*-test (two tailed for independent means) was used to compare the outcomes of the measured variables. Significance for all analyses was assessed at *p*-value of less than 0.05 (two-tailed).

Results

The study included 40 patients who were 23 boys (57.5%) and 17 girls (42.5%). Their ages ranged between 28 months and 140 months with an average of 51.21 ± 21.94 months. The average age for group-1 was 63.7 ± 27.12 months and for group-2 was 56.25 ± 17.29 months. The main presentation in all cases was disfiguring facial swelling, which was associated with dull aching pain in 5 cases (12.5%). The cyst involved the right side in 21 cases (52.5%), and the left side in 19 cases (47.5%).

The operative time in group 1 ranged between 55-110 minutes with an average of 78.6 ± 0.52 while in group 2 it was between 35-65 minutes with an average of 49.85 ± 0.13 (Table 1 and Figure 1A). The length of hospital stays in group 1 extended between 12-34 hours with an average of 19.84 ± 0.65, while in group 2 it was between 2-5 hours with an average of 3.15 ± 0.16 (Table 1 and Figure 1B). The follow-up period ranged from 8-10 months with an average of 8.56 ± 0.68.

In group 1, the complications were intraoperative ruptured cyst in 3 cases and iatrogenic skin penetration in another case. Postoperative transient frontal nerve paresis was noted in one case, subgaleal seroma in another one and supraorbital scar due to repair of an intraoperative skin penetration in a third case. In group 2, one patient had intraoperative cyst rupture while no postoperative

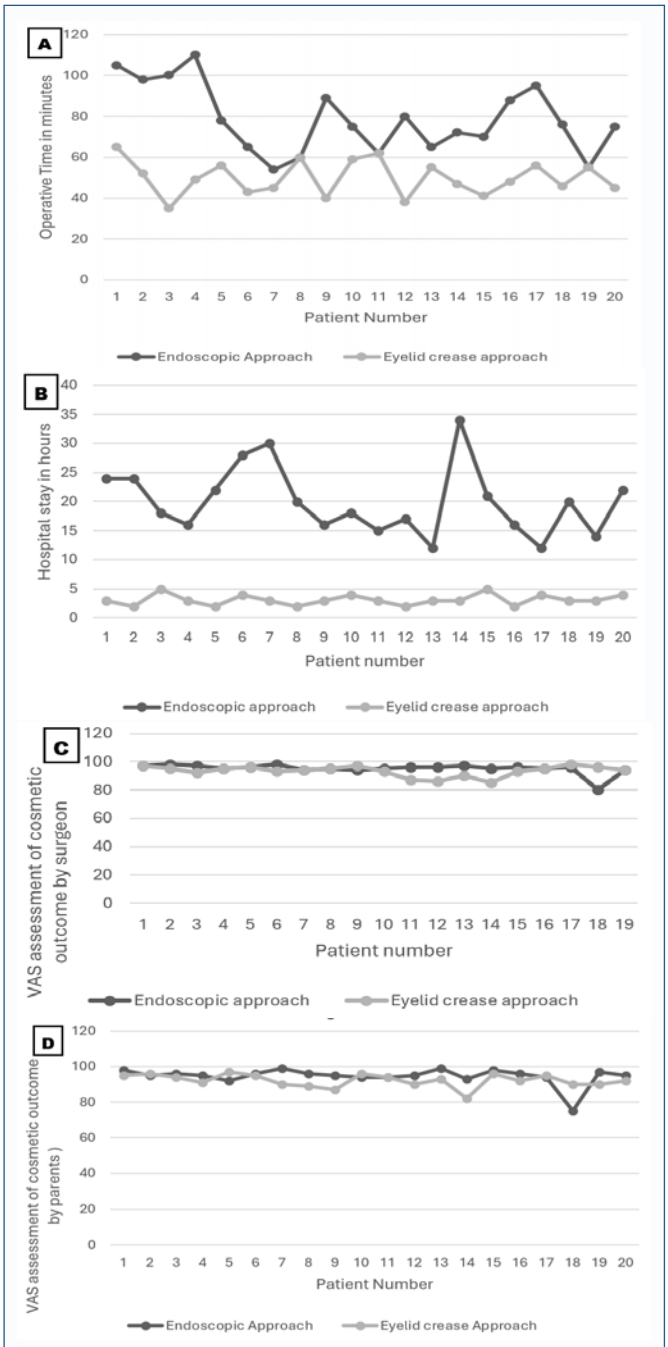


Figure 1: Illustration of the surgical and cosmetic outcomes of endoscopic and upper eyelid crease approaches for excision of pediatric external angular dermoid cysts; (A): the operative time of the patients in the two study groups, (B): the hospital stay of the patients in the two study groups, (C): the assessment of cosmetic outcome by surgeon (scar assessment) for patients in the two study groups and (D): the assessment of cosmetic outcome by parents (scar assessment) for patients in the two study groups.
VAS: Visual Analog Scale

complications were detected (Table 1).

Ruptured cysts were managed by meticulous dissection of the cyst wall until complete excision was achieved. The penetrated skin was repaired by two interrupted 5/0 polyprolene sutures. Transient frontal nerve paresis recovered completely with physiotherapy after 2 months. Seromas were treated with aspiration and elastic bandage. The supraorbital scar was managed by topical creams.

VAS for assessment of cosmetic outcome by surgeon (scar assessment) in group 1 ranged between 80%-98% with a mean of 94.85 ± 0.26 while in group 2, it was between 85% - 98% with a mean of 93.3 ± 0.54. VAS for assessment of cosmetic outcome by the parents (scar assessment) in group 1 ranged between 75%-99% with a mean of 94.6 ± 0.47 while in group 2, it was between 82%-97% with a mean of 92.2 ± 0.25 (Table 1 and Figure 1C and 1D).

Shapiro-Wilk test was used to determine the normality of the groups pre-operatively. The *p*-value was 0.28 and W was 0.944145. It was in the 95% critical value accepted range; hence, the data was found to be potentially symmetrical and mesokurtic. Student's t test (two tailed for independent means) was used to compare the outcomes of the measured variables. Out of all the parameters analysed, operating time and hospital stay were higher in the group-1, with a highly significant result ($p = 0.0001$). Postoperative complications were also significantly higher in group-1 ($p = 0.04$) (Table 1).

The cosmetic presentation (p-value 0.06), pain (p-value=0.19) and the intraoperative complications (*p*-value 0.07), though higher in group-1, were not statistically significant. Postoperative scar evaluation by the surgeon was better in group-1, though not statistically significant (*p*-value 0.09). However, the postoperative scar evaluation by the patients' parents was significantly better in group-1 (*p*-value 0.04) (Table 1).

Discussion

Surgical excision is the treatment of choice for EADCs. It is advocated to avoid the possibility of spontaneous rupture, fistula formation, continued enlargement and bone erosion, which may affect facial symmetry and esthetics [11]. The primary target of excision is to remove the EADCs with the cyst wall intact. Iatrogenic cyst rupture and leakage of its contents and can cause inflammation. Incomplete cyst removal causes recurrence, while cysts removed entirely do not recur [11].

Many approaches for the excision of EADCs have been described. The traditional approach involves a direct incision over the cyst. This approach was transformed into the lateral eyebrow incision to hide the scar within the hair-bearing area of the brow. It was associated with suboptimal scar, peri-incisional alopecia and hypopigmentation [11]. UECA offers excellent exposure and undetectable scar [12, 13]. EA results in a hidden scar in the scalp and yields satisfactory cosmetic results, but it may be complicated by scar alopecia, incomplete cyst excision, and frontal nerve damage [8].

In our study, the mean operative time and hospital stay for UECA were much less than those for EA, while the operating time and hospital stay were higher in EA, with a highly significant result ($p = 0.0001$). This is because UECA is simple, easy to perform and near to the lesion while EA is technically demanding and needs special training and sophisticated equipment. Also, it is far from the cyst. This agrees with Cozzi *et al.,* [6], who reported that the UECA is a straightforward procedure that requires minimal equipment and offered adequate access to the area of the frontozygomatic suture where EADCs are commonly occur [6]. EA is a technically and financially challenging procedure with a steep learning curve, demanding sophisticated technical experience and expensive equipment [7, 14-16].

In this study, we reported five important complications related to EA. They were ruptured cyst (in 3 cases), iatrogenic skin penetration (in one case), transient frontal nerve paresis (in one case), subgaleal

Table 1: Statistical significance of the study outcomes for the two groups.

Parameter	Group-1		Group-2		Statistical Analysis $p \leq 0.05$ = Significant
	Mean	Standard Deviation	Mean	Standard Deviation	
Operating time (min)	78.6	0.52	49.85	0.13	0.0001 (highly significant)
Hospital stays (hours)	19.84	0.65	3.15	0.16	0.0001 (highly significant)
Intra-operative complications	0.4	0.2	0.22	0.05	0.07 (not significant)
Post-operative complications	0.43	0.25	0.22	0.05	0.04 (significant)
Assessment of cosmetic outcome by surgeon (scar assessment): (VAS* 0 - 100)	94.85	0.26	93.3	0.54	0.09 (not significant)
Assessment of cosmetic outcome by parents (scar assessment): (VAS* 0 - 100)	94.6	0.47	92.2	0.25	0.04 (significant)

VAS: Visual Analog Scale

seroma (in one case), and supraorbital scar due to repair of an intraoperative skin penetration (in a third case). Also, we noted that the upper eye crease incision approach was associated with few and less critical complications. Only one patient had intraoperative cyst rupture while no postoperative complications were detected.

Huang *et al.,* [17] excised five cases of EADCs *via* EA. They reported complications in two of the five cases in the form of an infection requiring incision and drainage and a transient frontal nerve paresis. Steele *et al.,* [18] investigated the EA for 10 cases of EADCs and reported two cases of frontal nerve paralysis. Lin *et al.,* [19] in their experience on six endoscopic EA, they reported uneventful postoperative courses, with no scalp dysesthesias and no detectable scars. Gur et al., [14] reported more complication than Lin *et al.,* [19], probably indicating that the complication rate of EA can decline with increased experience.

In this study, we noticed more overall intraoperative and postoperative complications were observed in EA. The intraoperative complications (*p*-value 0.07), though higher in group-1, were not statistically significant. This agrees with Hachach-Haram [8], who found that the upper eyelid crease incision avoids the complications of disruption of hair follicles, scar, and nerve paresis, all potential morbidity of EA. They recommended the UECA as the optimal approach to excision of EADCs.

In this study, the mean VAS for assessment of cosmetic outcome by surgeon and the patents (scar assessment) in group 1 was slightly higher than in group 2. Some studies reported that EA showed satisfactory cosmetic outcome, but it was associated with some cases of facial nerve damage and carries the risk of scar alopecia and incomplete excision [7, 14-16]. Also, our data agree that most EADCs can be managed through UECA with adequate exposure and accepted esthetic result. It provided adequate exposure, and leave a conspicuous scar [13, 17, 20].

Stuzin *et al.,* [21] reported that the principal advantage of EA is the avoidance of a conspicuous facial scar. They thought the application of this approach could be beneficial when there is a greater tendency toward hypertrophic scarring or keloid formation. In accordance with Steele *et al.,* [18], we found the UECA resulted in an esthetically pleasing result, but it can be associated with increased risk of the frontal nerve injury [18].

In this study, we found that the EA had higher cost because of the use of the endoscopic set and prolonged operative time, especially at the beginning of the practice. We noted a decrease in the operative time as the frequency of procedures performed increased. We agree some authors who claim the use of EA may not be necessary for small lesions around the eyebrow [18].

This study, clearly revealed that UECA is much better than the endoscopic approach in almost all aspects, except the cosmetic appearance of the post-operative scar, which was obviously better in the EA, as this approach required a hidden incision which was much less conspicuous. The authors found UECA to be a versatile incision that allowed excision of EADCs some distance away from the incision. The skin is highly pliable, facilitating traction, and allowing the incision to hide in the natural fold of the upper eyelid, making it hardly perceptible. It is associated with high esthetic success outcomes and low complication rates.

Conclusions

Although EA has better cosmetic outcomes, we found UECA is advantageous than the endoscopic approach in almost all aspects. We recommend upper eyelid crease approach for excision of EADCs, because it is versatile, simple, cost-efficient approach with better surgical outcomes and satisfactory cosmetic outcome. Further studies which have larger sample size are warranted.

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