

## The cosmetic outcome of external dacryocystorhinostomy scar and factors affecting it

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**Purpose:** To study the cosmetic outcome of external dacryocystorhinostomy (Ex-DCR) and to detect the factors affecting it. **Patients and Methods:** Prospective randomized interventional study included forty patients who were treated by 40 Ex-DCRs. In twenty patients, medial canthal vertical incision was used and in the other twenty cases, subciliary incision was used. The skin was closed using vicryl 6-0 or prolene 6-0 interrupted sutures, and each one was randomly used in twenty patients (10 patients of each incision type). Cosmetic outcome was evaluated 6 months postoperative by the patients and by an oculoplastic surgeon on a four grades scale. Cosmetic results and its correlation to patients' age, sex, skin complexion, type of incision, and type of skin sutures were studied. **Results:** The mean scar grading was  $0.98 \pm 1.0$  and  $1.3 \pm 1.0$  in patients' and examiner's assessment. About 27.5% described their scars as cosmetically significant. The cosmetic outcome was significantly affected by the type of incision with only 5% significant scars in subciliary incision group. Prolene 6-0 suture was associated with better cosmetic results with 15% significant scars. 50% of dark-skinned patients showed cosmetically significant scars. Although no correlation was found between patients' age and cosmetic outcome, pediatric patients showed higher tendency to scar visibility with mean scar grade  $1.2 \pm 1.0$  and  $1.5 \pm 0.9$  in patients' and examiner's assessment. **Conclusion:** Dark skinned and pediatric patients are more prone to visible Ex-DCR scar. The use of subciliary approach and prolene 6-0 skin sutures is associated with more favorable cosmetic outcome.

**Key words:** Cosmetic results, dacryocystorhinostomy incision, dacryocystorhinostomy scar, external dacryocystorhinostomy

External dacryocystorhinostomy (Ex-DCR) is among the common oculoplastic surgeries and is considered as the gold standard for surgical correction of primary acquired nasolacrimal duct (NLD) obstruction.<sup>[1,2]</sup> It is a highly successful procedure with a success rate more than 90% quoted in different series since it was first described by Toti in 1904 and modified by Dupuy-Dutemps in 1921.<sup>[2-4]</sup>

The inevitable downside of Ex-DCR has been an external skin scar, which has led to the evolution of several nonincisional techniques with variable success rates.<sup>[5-9]</sup>

There have been few studies that have addressed the visibility of Ex-DCR scars, which has been reported to vary from 9% to 33%.<sup>[10-12]</sup> There is an increasing demand on an oculoplastic surgeon from their patients and referring physicians to do endonasal surgery. Young and middle-aged patients are increasingly aware of the endonasal approach and are easily dissuaded by a skin scar. While we wait for endonasal procedures to evolve and achieve comparable success rates, an external approach DCR that can successfully hide the scar is highly desirable.<sup>[13]</sup> It is important for an oculoplastic surgeon to know the factors that may have an influence on the Ex-DCR scar. In this study, we aimed to evaluate the cosmetic outcome

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of Ex-DCR among Egyptian patients and to identify the factors affecting it.

### Patients and Methods

This prospective randomized interventional study included forty patients (forty procedures) who underwent Ex-DCR over a period of 18 months (July 2013 to December 2014). Patients were subjected to full ophthalmological evaluation and lacrimal system examination including fluorescein dye disappearance test, regurgitation test, diagnostic probing, and irrigation. Patients with punctal or canalicular pathology, acute dacryocystitis, or previous lacrimal surgery were excluded from the study. The study adhered to the principles of the Declaration of Helsinki and has been approved by the Institutional Ethical Committee.

Data about the patients' age, sex, and skin complexion (fair skinned or dark skinned) were collected. The patients were randomly distributed between 2 age and sex matched groups, each one including twenty patients. In Group A patients

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underwent Ex-DCR through the conventional vertical incision done 10 mm medial to the medial canthus. While in Group B a subciliary incision along the medial half of the lower eyelid was used. In both groups, the incision extended 10–15 mm. The standard surgical procedure of Ex-DCR was performed. Upon the completion of the procedure, the orbicularis and the skin were opposed by interrupted sutures. Two different suture types (either prolene 6-0 or vicryl 6-0) were randomly used in 10 patients of each group.

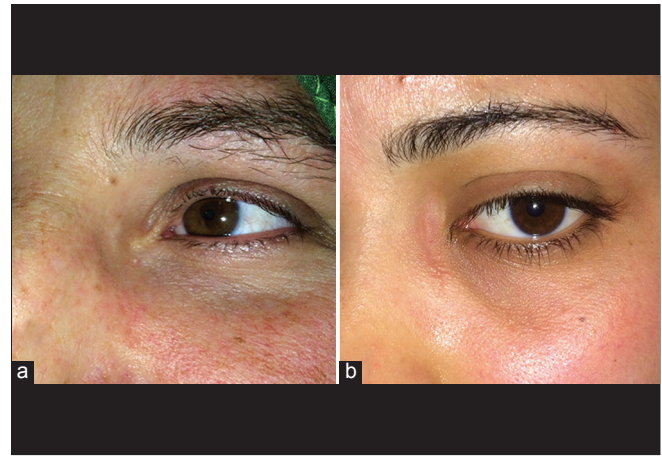
The postoperative care included topical administration of combined antibiotic steroids drops for 1–2 weeks. The skin sutures were removed 1 week postoperative. The patients were examined 1 week, 6 weeks, 3 months, and 6 months postoperative for evaluation of functional and cosmetic outcomes of the procedure. The functional outcome was judged by symptomatic relief of epiphora and patent syringing of the lacrimal passages. The cosmetic outcome was subjectively evaluated by the patients and by an oculoplastic surgeon other than the operating surgeon. By the end of the follow-up, the patients (or the parents of children patients younger than 8 years) were asked to grade the visibility of the scar on a four grades scale: 0, invisible scar; 1, minimally visible scar; 2, moderately visible scar; and 3, very visible scar. The oculoplastic surgeon used the same grading scale taking in consideration that the examiner did not know the patient's opinion about the scar evaluation. Scars of Grade 0 and 1 were considered cosmetically insignificant [Figs. 1 and 2], and scars of Grade 2 and 3 were considered cosmetically significant [Fig. 3].

The data about cosmetic outcome were collected. The effect of different factors including the patient's age, sex, skin complexion, type of incision, and type of skin sutures were studied and statistically analyzed using the mean value, standard deviation, Chi-square test, and Student's *t*-test (IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp).

## Results

This prospective randomized interventional study included forty patients who were treated by Ex-DCR (forty procedures). Twenty-five patients (62.5%) were females. The patients' age ranged from 3.5 years to 71 years with a mean of  $30.7 \pm 18.7$  years. The study included 12 (30%) children <18-year-old, 16 (40%) young adult patients 40-year-old or less, and 12 (30%) patients older than 40 years. By the end of the follow-up period (6 months postoperative), only one patient (2.5%) showed persistent epiphora with lacrimal block on irrigation, with functional success rate of 97.5%. The mean patients' scar evaluation was  $0.98 \pm 1.0$  while the mean examiner evaluation was  $1.3 \pm 1.0$ . Eleven patients (27.5%) evaluated their scars as cosmetically significant (Grade 2 or 3) while the examiner evaluation classified 17 scars (42.5%) as cosmetically significant. The examiner scar grading was noticed to be higher than the patients' one, which was not statistically significant ( $P = 0.148$ ).

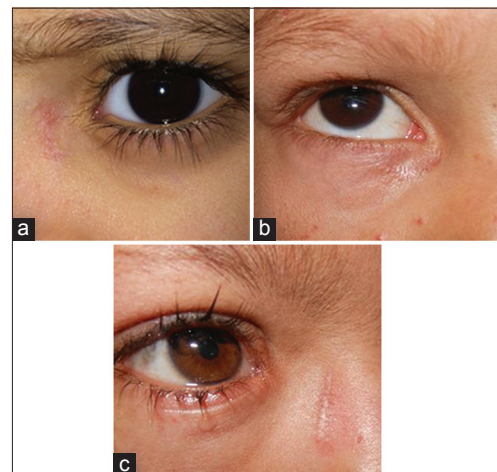
The type of Ex-DCR incision was found to be the factor that significantly affected the final cosmetic outcome of the procedure. Among twenty patients who were operated through subciliary incision, one patient (5%) described his scar as cosmetically significant (Grade 2). While in the conventional vertical incision group, 10 patients (50%) felt that their scars



**Figure 1:** Cosmetically insignificant scars of external dacryocystorhinostomy in patients done with vertical incision. (a) Vertical incision scar Grade 0. (b) Vertical incision scar Grade 1



**Figure 2:** Cosmetically insignificant scar Grade 0 of external dacryocystorhinostomy in patient done with subciliary incision



**Figure 3:** Cosmetically significant scars of external dacryocystorhinostomy. (a) Vertical incision scar Grade 2. (b) Subciliary incision scar Grade 2. (c) Vertical incision scar Grade 3

are cosmetically significant ( $P = 0.003$ ) [Table 1]. The use of prolene 6-0 sutures for skin closure was associated with better cosmetic results; however, the difference was statistically insignificant. Three patients of 20 (15%) in whom prolene 6-0 was used classified their scars as Grade 2 or 3 in comparison to eight patients (40%) in the vicryl 6-0 group had similar scar grading ( $P = 0.358$ ) [Table 2].

The age of the patients did not affect the final cosmetic outcome. The mean age of patients grading their scars as Grade 0 and 1 was  $31.2 \pm 19.5$  years while it was  $29.5 \pm 16.6$  years for patients with scar Grading 2 and 3 ( $P = 0.504$ ). Pediatric patients showed higher tendency for scar visibility. The mean scar grade in pediatric patients was  $1.2 \pm 1.0$  when assessed by the patients (or their parents) and  $1.5 \pm 0.9$  when assessed by the examiner. While the mean scar grade for young adults (19–40-year-old) was  $0.8 \pm 0.9$  in patients' assessment and  $1.2 \pm 1.0$  in examiner's assessment, it was  $0.9 \pm 1.1$  and  $1.2 \pm 1.1$

when assessed by the patients and the examiner respectively in patients older than 40 years. Among the 11 patients who found their scars cosmetically significant, 6 patients (54.5%) were females and 5 (45.5%) were males. The study included eight dark-skinned patients (the skin complexion evaluation reflected just subjective evaluation and were not due to racial differences). Four of them (50%) graded their scars as Grade 2 or 3. Seven (21.9%) of the fair skinned patients felt that their scars are cosmetically significant. The mean scar grade for fair skinned patients was  $0.8 \pm 0.9$  in patients' assessment and  $1.2 \pm 1.0$  in the examiner's one while it was  $1.4 \pm 1.3$  and  $1.7 \pm 1.1$  in the patients' and examiner's assessment respectively for dark-skinned patients. This difference was found statistically insignificant which may be attributed to the small number of dark-skinned patients in the study ( $P = 0.347$ ) [Table 3].

### Discussion

Ex-DCR has stood the test of time; it has been the standard treatment for NLD obstruction for more than a 100 years.<sup>[14]</sup> In the recent years, the disadvantage of cutaneous scar has led to the evolution of several nonincisional DCR techniques.<sup>[5-9]</sup> The endonasal approach for DCR was introduced in 1893 by Caldwell, but it was inherently limited by poor visibility of endonasal anatomy during surgery. The introduction of high-resolution fiber-optic endoscope in the late 1980s enabled adequate visualization of the nasal cavity paving the way for the endonasal approach for DCR.<sup>[15-19]</sup> The established advantages of endoscopic DCR includes avoidance of a cutaneous scar, less disruption of medial canthal anatomy, decreased operative time, decreased postoperative morbidity and enhanced recovery and the ability to concurrently address nasal and or paranasal sinus abnormalities through the same approach.<sup>[20]</sup> The disadvantages of endonasal DCR include the high costs of equipment and maintenance, possibility of orbital perforation, the necessity to use general anesthesia that is preferred by most surgeons, a marked learning curve and difficulties in the treatment of canalicular or common canalicular pathologies.<sup>[20,21]</sup> Endocanalicular laser DCR is another nonincisional approach for NLD obstruction. It has the advantage of avoiding orbital perforation since the laser is directed toward the nose and away from orbit. It obviates other instruments as punches and drills and is more familiar for the ophthalmologist. If has the disadvantages of high costs and the need for multiple weekly postoperative visits for cleaning and irrigation of the osteotomy to improve the outcome.<sup>[19]</sup>

Few studies have looked at the cosmetic significance of Ex-DCR scar, and there is no established method for patient assessment of surgical scars. Previously published studies about Ex-DCR have shown that patient satisfaction may not necessarily correlate with objective success rate and in case of a cutaneous scar, the only reliable way to ascertain the significance of the scar is from patient feedback.<sup>[22-24]</sup> Tarbet and Custer reported that 2.6% of patients had noticeable scar.<sup>[2]</sup> Caesar *et al.* reported that 33% of patients noted their scar to be visible and only 3% of patients to be unhappy with the Ex-DCR scar.<sup>[11]</sup> Sharma *et al.* recorded that 19.4% of patients had visible scars, and only 10.3% had cosmetically significant scars.<sup>[12]</sup> In this study, the cosmetic outcome of Ex-DCR scar was evaluated by the patients and by an oculoplastic surgeon other than the operating surgeon on a scale of four grades. The mean patients scar grading was  $0.98 \pm 1.0$  while the mean examiner grading was  $1.3 \pm 1.0$ . It

**Table 1: Correlation between external dacryocystorhinostomy scar grading and the type of external dacryocystorhinostomy incision**

	Patients, n (%)		Chi-square	
	Subciliary incision	Vertical incision	$\chi^2$	P
Patients' scar grading				
0	13 (65)	3 (15)	13.898	0.003*
1	6 (30)	7 (35)		
2	1 (5)	6 (30)		
3	0 (0)	4 (20)		
Total	20	20		
Examiner's scar grading				
0	7 (35)	3 (15)	9.856	0.020*
1	9 (45)	4 (20)		
2	4 (20)	8 (40)		
3	0 (0)	5 (25)		
Total	20	20		

(\*) means statistically significant.

**Table 2: Correlation between external dacryocystorhinostomy scar grading and the type of sutures used for skin closure**

	Patients, n (%)		Chi-square	
	Prolene 6-0	Vicryl 6-0	$\chi^2$	P
Patients' scar grading				
0	9 (45)	7 (35)	3.228	0.358
1	8 (40)	5 (25)		
2	2 (10)	5 (25)		
3	1 (5)	3 (15)		
Total	20	20		
Examiner's scar grading				
0	7 (35)	3 (15)	2.826	0.419
1	5 (25)	8 (40)		
2	5 (25)	7 (35)		
3	3 (15)	2 (10)		
Total	20	20		

**Table 3: Correlation between external dacryocystorhinostomy scar grading and the patients' skin complexion**

	Patients, n (%)		Chi-square	
	Fair skinned	Dark skinned	$\chi^2$	P
Patients' scar grading				
0	14 (43.8)	2 (25)	3.307	0.347
1	11 (34.4)	2 (25)		
2	5 (15.6)	2 (25)		
3	2 (6.3)	2 (25)		
Total	32	8		
Examiner's scar grading				
0	9 (28.1)	1 (12.5)	2.236	0.525
1	11 (34.4)	2 (25)		
2	9 (28.1)	3 (37.5)		
3	3 (9.4)	2 (25)		
Total	32	8		

was noted that the examiner scoring of the scars was always higher than the patient's one, which was also noticed by other authors.<sup>[10,13]</sup> Among study patients, 27.5% evaluated their scars as cosmetically significant. This higher incidence of visible scars may be attributed to younger age of the patients compared to other studies, as well as racial and environmental factors.

Skin incisions inevitably leave a cutaneous scar along the incised line. The extent of scar formation is variable and depends on many factors. To minimize postoperative skin incision line scarring, the incision should be placed in area of thin skin and relatively low skin tension. The incision should be of minimal length and should be made parallel to lines of relaxed skin tension, or perpendicular to the direction of muscular contraction. In this regard, an eyelid incision is more suitable for Ex-DCR than a medial canthal incision, which is not parallel to relaxed skin tension lines.<sup>[25-27]</sup>

In 1989, Harris *et al.* demonstrated that Ex-DCR can be done through a horizontal incision placed on a lower lid crease.<sup>[28]</sup> Other few studies then reported the cosmetic advantages of subciliary incision for Ex-DCR.<sup>[13,27,29]</sup> Some advantages of this approach, other than the cosmetic advantage, were reported including that the dissection is in the lower lid minimizing the bleeding, there is no concern about angular vessels injury, and the lacrimal sac is approached from below at the NLD entrance and the osteotomy site is thus quite low preventing any degree of sump syndrome.<sup>[29]</sup> Inadequate exposure was reported with this approach, and the amount of wound retraction needed during ostium creation is certainly more than a standard incision. This approach is likely to give good results in the hands of an oculoplastic surgeon who is familiar with subciliary incision for other eyelid or orbital surgeries. A comprehensive ophthalmologist who performs an occasional Ex-DCR may need some formal training to get the best results with this approach.<sup>[13]</sup> In this study, it was found that the type of incision was the most important factor that significantly influenced the cosmetic results. Fifty percent of patients with conventional medial canthal vertical incision had cosmetically significant scars, in comparison to 5% of patients with subciliary incision.

The cosmetic results of Ex-DCR scar were not affected by the patient's age, although pediatric patients showed higher scar grading. On the other hand, Sharma *et al.* found the scar to be less prominent in elderly, which was also reported by other authors.<sup>[12,30,31]</sup> This difference may be explained by the difference in patients' age in this study, which included only 7 (17.5%) patients 50-year-old or more.

Fifty percent of dark-skinned patients had cosmetically significant scars, and the mean scar grading in dark-skinned patients was higher compared to fair-skinned cases. Though there are no published reports, scar hypertrophy, and pigmentary changes continue to be an important undesirable side effect of any skin incision in the pigmented races.<sup>[13]</sup>

The effect of the type of sutures used for skin closure on Ex-DCR scar was not studied before. Many authors reported the use of nylon 6-0 or 7-0 sutures while others reported the use of vicryl 6-0 sutures for skin closure.<sup>[13,27,29]</sup> Braided sutures (like the vicryl) usually incite a greater inflammatory response. The monofilament sutures cause less reaction but require more ties to assure an adequate maintenance of the knot.<sup>[32]</sup> We found that the use of prolene 6-0 sutures for skin closure had given better cosmetic results with only 15% cosmetically significant scars.

## Conclusion

Pediatric patients show higher tendency for visible scars. Dark-skinned patients are more prone to develop cosmetically significant scars. The use of subciliary approach significantly improves the cosmetic outcome and the use of monofilament nonabsorbable sutures for skin closure (as prolene 6-0) is associated with less scar visibility.

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## Conflicts of interest

There are no conflicts of interest.

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