

# Comparison of cutaneous incisions to approach the infraorbital rim and orbital floor

Juliana de Melo Crosara<sup>1</sup>, Everton Luis Santos da Rosa<sup>2</sup>, Micena Roberta Miranda Alves e Silva<sup>3</sup>

<sup>1</sup> DDS, Oral and Maxillofacial Surgeon, Private Practice –Uberlândia-(MG) Brazil

<sup>2</sup> DDS, MSc, Oral and Maxillofacial Surgeon Hospital de Base -Brasília–(DF), Brazil

<sup>3</sup> DDS, MSc, Anatomist, Federal University of Minas Gerais (UFMG), Belo Horizonte (MG), Brazil

## Abstract

**Aim:** The aim of this article was to retrospectively analyze and compare the esthetic outcomes achieved after the use of 20 subciliary incisions, 22 subtarsal incisions and 16 infraorbital incisions to approach the infraorbital rim and orbital floor in orbital fractures. **Methods:** The sample consisted of 58 patients (37 males and 21 females) with orbital trauma (floor and infraorbital rim) treated with open reduction and internal rigid fixation in the Department of Oral and Maxillofacial Surgery at "Hospital de Base do Distrito Federal", Brazil, between September 1996 and August 2003. The following aspects were evaluated: (1) the average distance of the scars measured from the ciliary margin caudally, (2) the esthetic appearance of the scars, (3) chronic lid edema, (4) scleral show, (5) ectropion. **Results:** Subciliary incision demonstrated better surgical results when compared to the non-subciliary incisions. No statistically significant difference in chronic lid edema rates was found between the three groups of incisions (Fisher,  $p > 0.217$  in all cases). There was no statistically significant difference in ectropion, scleral show and chronic edema rates between the three groups of incisions. **Conclusions:** The subciliary and subtarsal incisions offer better esthetic results than the infraorbital incision,

**Keywords:** facial injuries, orbital fractures, eyelid, incisions.

## Introduction

Several types of incisions have been used to approach the infraorbital rim and orbital floor, such as conjunctival, subciliary, subtarsal and infraorbital incisions, in addition to the endoscopically assisted intraoral approach<sup>1</sup>.

The subciliary incision is placed about 2 mm caudal to the ciliary line. Dissection may proceed in three different ways: the skin flap (in which the orbicularis muscle is divided at the level of the infraorbital rim), the non-stepped skin-muscle flap (in which the orbicularis muscle is divided at the same level of the skin incision) and the stepped skin-muscle flap (in which the orbicularis muscle is divided 2 to 3 mm below the level of the skin incision), keeping the pretarsal fibers of the orbicularis muscle attached to the tarsal plate, and assisting in the maintenance of the eyelid position and its contact with the globe; in other words, it presumably helps preventing ectropion and scleral show<sup>2</sup>.

The subtarsal incision, also termed mid-lower eyelid incision, is placed in a natural subtarsal lid crease, about 5 to 7 mm below the ciliary margin. The dissection must be done in

Received for publication: April 8, 2009

Accepted: June 22, 2009

Correspondence to:

Everton Luis Santos da Rosa  
SEPN 504, Edifício Mariana, sala 10, subsolo – Asa Norte  
CEP: 70730-523 – Brasília (DF), Brazil  
E-mail: zazai547@terra.com.br

a stepped skin-muscle flap fashion, dividing the orbicularis fibers a few millimeters below the level of the skin incision<sup>2</sup>.

The infraorbital incision is typically placed in a skin crease at the junction of the thin eyelid skin and the thicker cheek skin, overlying the inferior orbital rim. The orbicularis muscle is divided at this same level<sup>3</sup>.

Although several studies have compared conjunctival and subciliary incisions, there are only two reports comparing cutaneous incisions. Holtmann et al.<sup>3</sup> compared the esthetic results achieved after the use of 45 subciliary incisions, 36 subtarsal incisions and 37 infraorbital incisions and found that the scar appearance was similar among the three groups. In fact, the only statistically significant difference mentioned in this study was the higher incidence of ectropion in the subciliary incision group. On the other hand, Bähr et al.<sup>4</sup> compared 16 subciliary incisions, 91 subtarsal incisions and 23 infraorbital incisions and found not only an incidence of ectropion, but also scleral show. Chronic edema and noticeable scar rates were statistically different between groups. Face to these controversies, the present study compared the cutaneous incisions with respect to the scar appearance and ectropion, scleral show and chronic edema rates, in order to determine which type of incision offers the best esthetic result. The aim of this article was to retrospectively analyze and compare cutaneous incisions to approach the infraorbital rim and orbital floor in orbital fractures in terms of scar appearance and ectropion, scleral show and chronic edema rates in order to determine which type of incision offers the best esthetic outcome.

## Material and methods

A retrospective study was developed with 58 patients (37 males and 21 female; age range at time of surgery: 17-50 years; mean age: 31 years) treated at the Department of Oral and Maxillofacial Surgery of Hospital de Base do Distrito Federal, Brazil, between September 1996 and August 2003. The Ethics Committee of the University of Brasília approved this study.

Only cases of fractures in which the orbital floor and infraorbital rim were surgically exposed for open reduction and internal

rigid fixation were considered. All enrolled patients had at least six months of follow-up and the cases that presented postoperative infection were excluded of the study. The subciliary incision had been used 20 times, the subtarsal incision had been used 22 times, and the infraorbital incision had been used 16 times. The following aspects were evaluated: (1) the average distance of the scars measured from the ciliary margin caudally, (2) the esthetic appearance of the scars, (3) chronic lid edema, (4) scleral show, (5) ectropion. The scars were characterized as noticeable or unnoticeable. Scleral show was considered when there was an increased visibility of the sclera below the lower margin of the iris compared to the opposite side. If the ciliary margin presented caudal draw and had lost contact with the bulbar conjunctiva, the change was characterized as ectropion. Each patient was evaluated by two of the authors (JMC and ELSR)

## Statistical analysis

Two categories were defined for each evaluated parameter (**Tables 1 and 2**). Tabulated data were analyzed by Fisher's exact test, with SigmaStat 3.1 statistical software (SPSS Inc., Chicago, IL, USA). Significance level was set at  $p < 0.05$ .

## Results

The average distance between the scar and the ciliary margin was 2.4 mm for the Subciliary Incision Group, 6.2 mm for the Subtarsal Incision Group and 9.6 mm for the Infraorbital Incision Group.

Regarding the scar appearance, both authors characterized all scars of the Subciliary Group as unnoticeable. In the Subtarsal Incision Group, the rates of unnoticeable scars were 68 and 63%, while in the infraorbital incision group, the rates of unnoticeable scars were 31 and 19%.

The higher unnoticeable rate for each surgical technique was used to test statistical differences among them. The subciliary incisions showed a higher rate of unnoticeable scars in comparison to the subtarsal incisions (Fisher,  $p = 0.009$ ) and infraorbital incisions (Fisher,  $p < 0.001$ ). The subtarsal incision demonstrated a tendency (border-line significance) to give better esthetic outcomes when compared to infraorbital incisions (Chi-squared,  $p = 0.055$ ). The subciliary incisions also demonstrated better surgical results when compared to the non-subciliary incisions (subtarsal and infraorbital incisions together) (Fisher,  $p < 0.001$ ).

The rate of scleral shown was 25% in the Subciliary Incision Group, 8% in the Subtarsal Incision Group and 19% in the Infraorbital Incision Group, though without statistical significance.

No cases of ectropion were found in the Subciliary Incision Group. The rate of ectropion in the Subtarsal Incision Group was 17%, and in the Infraorbital Incision Group was 6%. There were no statistically significant differences between the incision groups (Fisher,  $p > 0.108$  in all cases). Scleral show was not different between

**Table 1.** Unnoticeable scar rates associated with each type of incision

Type of incision	Total incisions	Unnoticeable scar (1)*	%	Unnoticeable scar (2)**	%
Subciliary	20	20	100	20	100
Subtarsal	22	15	68	14	63
Infraorbital	16	5	31	3	19

\* Unnoticeable scar rate according to the evaluation of author JMC; \*\* unnoticeable scar rate according to the evaluation of author ELSR.

**Table 2.** Ectropion, scleral show and chronic edema rates associated with each type of incision

Type of incision	Total incisions	Ectropion	%	Scleral show	%	Chronic edema	%
Subciliary	20	0	0	4	20	0	0
Subtarsal	22	4	18	31	3	0	0
Infraorbital	16	1	6	3	19	2	12,5

the incision groups (Fisher,  $p > 0.681$  in all cases). Only two cases of chronic lid edema were observed, both in the Infraorbital Incision Group (12.5%). In spite of this, no statistically significant differences in chronic lid edema rates were found between the three incision groups (Fisher,  $p > 0.217$  in all cases). The number of impairments associated with each type of incision is presented in **Table 2**.

## Discussion

This study suggests that the average distance between the scar and the ciliary margin was 2.4 mm for the Subciliary Incision Group, 6.2 mm for the Subtarsal Incision Group and 9.6 mm for the Infraorbital Incision Group. Bähr et al.<sup>4</sup> found an average distance of 1.5 mm for the subciliary incisions, 3.5 mm for the subtarsal incisions and 9.5 mm for the infraorbital incisions.

Regarding the scar appearance, the findings of the present study suggest that the rate of unnoticeable scars is significantly higher when higher incisions (subciliary and subtarsal) are used instead of the infraorbital incision. However, no statistically significant difference was observed with respect to the scar appearance between the subciliary and the subtarsal incisions groups. A retrospective study of 16 subciliary incisions, 91 subtarsal incisions and 23 infraorbital incisions<sup>4</sup> also demonstrated that, considering the craniocaudal placement of the incisions, the esthetic appearance of the scar deteriorates from the subciliary margin downwards. The authors found that the rate of noticeable scars was 17.4% in the Infraorbital Incision Group, 2.2% in the Subtarsal Incision Group and 0% in the Subciliary Incision Group. However, Holtmann et al.<sup>3</sup> did not find any statistically significant difference of imperceptible scars rate among the 45 subciliary incisions, 36 subtarsal incisions and 37 infraorbital incisions evaluated in their research. As far as it could be ascertained, there are no other studies comparing the esthetic appearance of the scars among these three types of incisions, but the superiority of the scar appearance when subciliary incisions are used is also corroborated by Heckler et al.<sup>5</sup>, who analyzed 154 subciliary incisions and found that in 100% of the cases, the scar appearance was considered to be excellent. Although there is not a consensus in the literature, it seems to be reasonable to consider that better esthetic results are reached, regarding the scar appearance, when higher incisions are used instead of the infraorbital incision. This establishment has its foundation on the anatomic bases of the eyelid region, and may be justified by the progressive increase of skin thickness and also by the progressive increase of excursion extent of the orbicularis' fibers so far as the incision is more inferiorly placed<sup>4</sup>.

The present study did not found any statistically significant difference of chronic lid edema rates among the three different types of incision, although the only two cases observed belonged to the Infraorbital Incision Group. Bähr et al.<sup>4</sup> reported that the occurrence of chronic edema is an approach-dependent phenomenon based on the observation of a higher incidence of chronic lid edema as far as the incision was more inferiorly placed. A possible explanation

for this edema distribution is that lower incisions interrupt larger lymphatic vessels, thus being responsible for a greater amount of chronic edema<sup>4</sup>.

The present study did not found statistically significant difference of eyelid vertical shortening rates between the three groups. On the other hand, Holtmann et al.<sup>3</sup> observed a significantly higher rate of ectropion (42%) in the Subciliary Incision Group, and Bähr et al.<sup>4</sup> found that both ectropion and scleral show rates were significantly higher the more superiorly was the incision. To the best of our knowledge, there is no other study comparing these three types of incisions regarding the incidence of vertical shortening of the lower eyelid. The literature shows that the incidence of ectropion and scleral show after subciliary incisions largely varies from one study to another. Netscher et al.<sup>6</sup>, in a prospective study of 20 subciliary incisions, found a scleral show rate of 70%. Heckler et al.<sup>5</sup> revised 154 subciliary incisions and did not find any cases of permanent ectropion or scleral show. Conversely, Smith and Wood-Smith<sup>7</sup> reported that with an incision placed below the tarsus, avoiding the orbicularis' pretarsal fibers, a vertical shortening of the lid is less likely than with the subciliary incision, since the vertical shortening deformity seems to be causally related to the tonus of the orbicularis oculi muscle in its tarsal portion. However, still following this line of thought, the occurrence of ectropion and scleral show seems to be more related to the kind of flap rather than to the kind of incision, since subciliary and subtarsal incisions, when used in association with the stepped skin-muscle flap, also preserve the pretarsal portion of the orbicularis attached to the tarsal plate. Moreover, there are many other factors that may contribute to the occurrence of vertical shortening, such as preexisting lid laxity, hypoplastic zygoma and relative globe protrusion<sup>8,9</sup>. In addition, there are many factors related to the surgical technique that may prevent the occurrence of ectropion and scleral show, such as avoidance of deep lateral dissection of the orbicularis muscle<sup>9</sup>, meticulous attention to hemostasis<sup>9</sup>, correct incision of the periosteum on the anterior surface of the rim, away from the orbital septum<sup>10</sup>; avoidance of wide dissection of the anterior periosteum<sup>11</sup>; use of the suspensory suture or Frost suture<sup>12,13</sup>, which may reduce in 50% the incidence of ectropion, according to Lacy and Pospisil's study<sup>12</sup> and, of course, of main importance, the use of a stepped skin-muscle flap. Certainly, no approach offers absolute protection against the possibility of eyelid retraction or ectropion: except for the conjunctival approach without lateral canthotomy, all of them leave an external scar that may be visible, even though each author advocates a different type of incision according to the results of their respective studies. According to Bähr et al.<sup>4</sup> the subtarsal incision combines the advantages of the infraorbital incision regarding the low risk of vertical shortening of the lower eyelid with the advantages of the subciliary incision regarding the formation of unnoticeable scars. Holtmann et al.<sup>3</sup> advocated the use of either the subtarsal or infraorbital incision instead of the subciliary incision, since their study demonstrated no statistically significant difference of unnoticeable scar rates between the three types of incision, but observed a significant higher rate of ectropion associated with the subciliary incision. An extensive liter-

ature review<sup>2</sup> stated that the superiority of one type of incision over another has not been clearly demonstrated. Ellis III and Zide<sup>13</sup>, supported by their vast clinical experience, have suggested the use of the subciliary incision because of the unnoticeable scar that generally results from it, associated with the stepped skin-muscle flap, in order to prevent the occurrence of ectropion.

The present study suggests the superiority of the subciliary and subtarsal incisions, and advocates their use instead of the infraorbital incision, since the subciliary and subtarsal incisions showed rates of unnoticeable scars higher than the infraorbital incision and no statistically significant difference in ectropion, scleral show or chronic edema rates were found between the three types of incision. In order to prevent vertical shortening of the lower eyelid, the use of a stepped skin-muscle flap or any other preventive measure, such as the use of a Frost suture, is suggested.

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