TRANSCONJUNCTIVAL APPROACH FOR SURGICAL REPAIR OF INFRAORBITAL RIM FRACTURES AND ORBITAL FLOOR FRACTURES

Abelovský J., Slávik R., Hocková B., Štorcelová D., Gembeš J., Kubec F., Kilipiris E., Stebel A.

Department of Maxillofacial Surgery, F. D. Roosevelt University Hospital in Banská Bystrica, Slovakia

The authors of the study declare that no conflict of interests exists in the compilation, theme and subsequent publication of this professional article, and that it is not supported by any pharmaceuticals company. The authors also declare that the study has not been submitted to any other journal.

Received: January 14, 2023
Accepted: May 17, 2023
Available on-line: July 30, 2023

MUDr. MDDr. Juraj Abelovský
Klinika maxilofaciálnej chirurgie
SZU
FNsP F. D. Roosevelta
Nám. L. Svobodu 1
975 17 Banská Bystrica
E-mail:juraj.abelovsky@gmail.com

SUMMARY

Aims: The aim of this study is to retrospectively evaluate the use of a transconjunctival surgical approach in maxillofacial surgery on the fractures of the infraorbital rim and the orbital floor by analyzing the operating time, the incidence of perioperative and postoperative complications, as well as the functional and aesthetic outcomes of transconjunctival surgical treatment.

Materials and methods: All the patients on whom we used a transconjunctival approach from December 2017 to December 2021 were included in this retrospective study. The epidemiological causes of fractures of the midface skeleton were analyzed. The length of the operating time of the transconjunctival approach with lateral canthotomy was compared with a control group in which the supraorbital eyebrow approach was performed. In addition, we analyzed the incidence of perioperative and postoperative complications in comparison with publications from other centers.

Results: We used the transconjunctival approach 103 times on 89 patients (in 14 patients the transconjunctival approach was performed bilaterally). In cases where the lateral canthotomy was used to extend the transconjunctival approach, there was no prolongation of the operating time. Perioperative complications included the perforation of the lower eyelid in 2 patients. In the postoperative period we recorded complications in 3 patients. Ectropion of the lower eyelid was present in one patient and entropion of the lower eyelid was observed in two patients. The percentage of perioperative and postoperative complications does not exceed the incidence of complications in transcutaneous approaches on the infraorbital rim.

Conclusion: Based on the results of our study, we can consider the transconjunctival approach, either alone or in combination with lateral canthotomy, to be a safe surgical technique, associated with a low risk of complications. Thanks to mucosal incision of the conjunctiva of the lower eyelid, it completely eliminates skin scarring on the face. Our results are comparable with the published results of foreign authors and workplaces with larger cohorts of patients, which similarly evaluate the transconjunctival approach as a quick and safe surgical approach to the inferior orbital rim, with a low risk of complications.

Key words: transconjunctival approach, infraorbital rim, orbital floor

Čes. a slov. Oftal., 79, 2023, No. 4, p. 170–176

INTRODUCTION

A transconjunctival approach was first used by Bourget in 1928. In 1971, Tenzel and Miler [1] used the approach for the reconstruction of small orbital fractures, but it was Tessier in 1973 [2] who popularized this approach to the visualization of the orbital floor and maxilla. At our workplace we have been using a transconjunctival approach as the regular, primary approach for the visualization and open surgical treatment of fractures of the infraorbital rim and orbital floor since the establishment of our center in 2017. In a transconjunctival approach to the infraorbital rim, we do not implement a skin incision, but instead a direct mucosal incision through the conjunctiva of the lower eyelid. We localize the incision following eversion of the eyelid close beyond the lower edge of the tarsal plate. Localization of the mucosal incision from the tarsal plate in an anterior-posterior direction defines the subsequent method of preparation in the transconjunctival approach. We differentiate between two possibilities of preparation following the conjunctival incision on the basis of the anatomical location of the preparation with regard to the orbital septum, spe-

cifically a preseptal or a retroseptal approach. At our center we prefer the preseptal method of transconjunctival approach. The transconjunctival approach does not restrict the selection of the type and size of the used osteosynthetic material. Following reduction and fixation, we have the option of suturing the conjunctiva with absorbent material, or we may leave the transconjunctival approach without suture (Fig. 1–8). At our clinic at present, we predominantly leave the transconjunctival approach without suture of the conjunctiva, and to date we have not observed a higher incidence of complications in connection with spontaneous healing without surgical closure of the incision of the conjunctiva by suture. Based on our experience, a transconjunctival approach provides a sufficient possibility for visualization of the infraorbital rim and orbital floor, and ensures a good overview in the operating field. During routine use of a transconjunctival approach, it was possible to shorten the operating time necessary from the first incision to the visualization of the infraorbital rim. We also use a transconjunctival approach in the case of bilateral fractures of the midface skeleton, with the necessity of surgical visualization of the infraorbital rim or the orbital floor either unilaterally or bilaterally. In the surgical treatment of isolated fractures of the base of the orbit, which we

Figure 1. Fixation stitches on lower eyelid and silicone protector for the cornea

Figure 2. Mucosal incision of the conjunctiva with a molopolar knife

Figure 3. Visualization of orbital septum during preseptal preparation

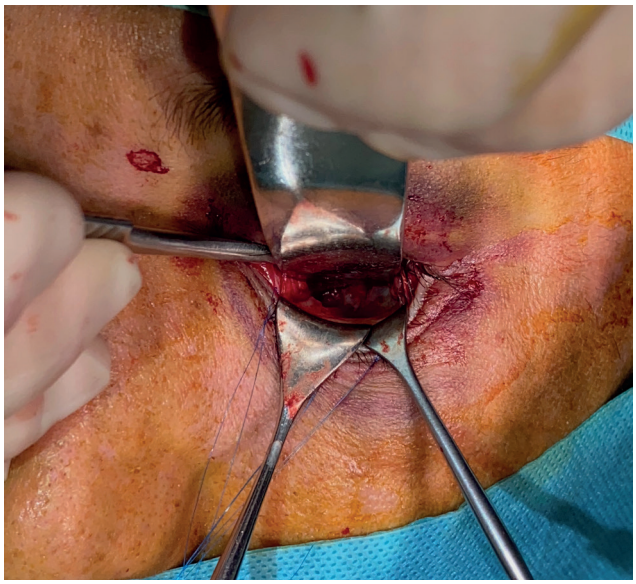


Figure 4. Orbital floor fracture

recorded in 15 patients (16.9%) in our group, no other approach than transconjunctival was used.

MATERIAL AND METHODS

Over the course of four years (from December 2017 to December 2021), a total of 292 patients were hospitalized at the Department of Maxillofacial Surgery of F. D. Roosevelt University Hospital in Banská Bystrica, for the purpose of surgical treatment of fractures of the facial skeleton, representing an average of 6 traumatological patients indicated for surgery per month. Of these, 180 patients (61.6%) were hospitalized and subsequently operated on due to injuries of the midface skeleton. From this cohort, 135 patients (75%) were indicated for open repositioning with internal fixation of fragments, and 45 patients (25%) were treated by means of closed repositioning without osteosynthesis.

A transconjunctival approach was used 103 times on 89 patients (on 14 patients we used a bilateral transconjunctival approach), which represents 66% of the total number of patients operated on with a fracture of the midface skeleton. For 21 patients (23.6%) the transconjunctival approach was the only surgical approach used, and in 68 patients (76.4%), it was a combination of a transconjunctival approach and another surgical approach. In our cohort of 89 patients on whom we used a transconjunctival approach in open repositioning and fixation of a fracture of the midface skeleton, 71 were men (79.7%) and 18 were women (20.3%). The most numerously represented age group was within the range of 21 to 30 years (30.3%), while the youngest

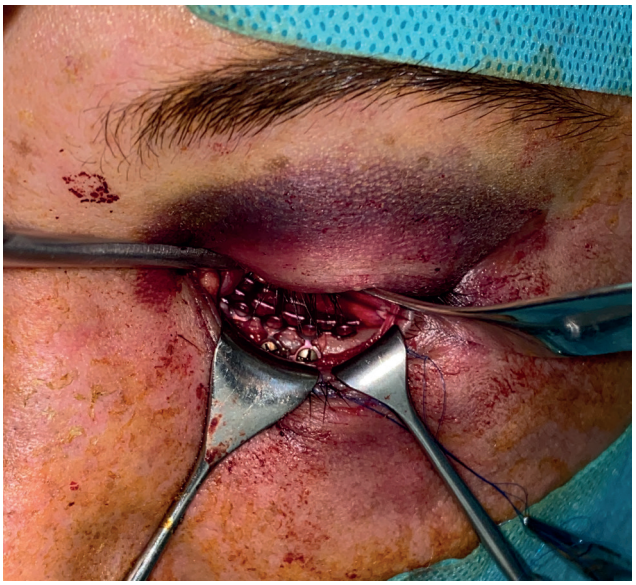


Figure 5. Orbital floor fracture repair with titanium mesh

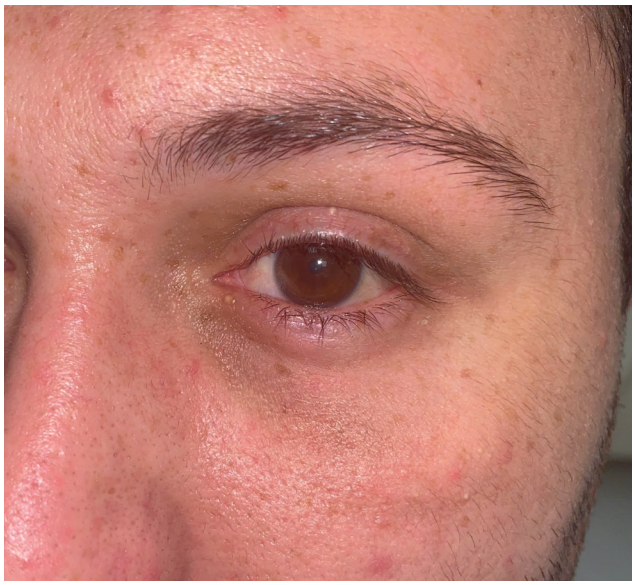


Figure 6. Follow up, 6 weeks after repair of orbital floor fracture

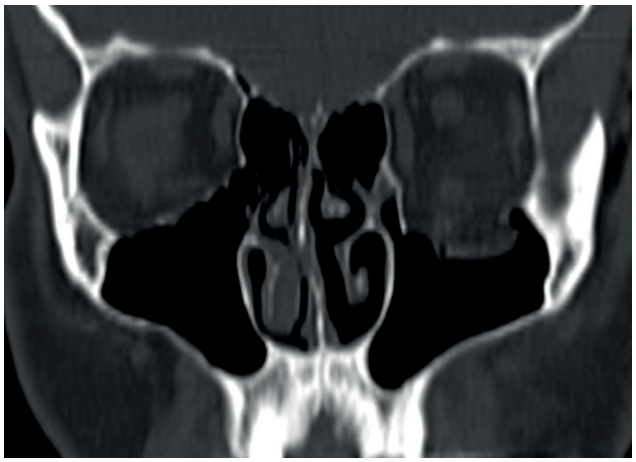


Figure 7. Preoperative CT scan of orbital floor fracture – coronal view

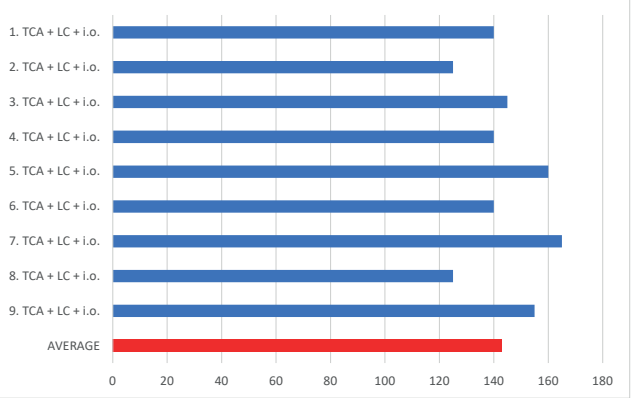
Figure 8. Postoperative CT scan with titanium mesh – coronal view

patient was aged 8 years and the oldest patient was aged 78 years. The most common cause of a fracture of the midface skeleton in the cohort of 135 patients was a fall – pertaining to 47 patients (36%). The second most common cause, relating to 43 patients (33%), was violent conduct involving another person, followed by a blow from a flying object in the case of 25 patients (19%). A traffic accident was the cause of injury in the case of 13 patients (10%).

RESULTS

We analyzed the use of a transconjunctival approach according to three basic indicators. First of all, we objectify the operating time necessary for the visualization of the fracture line, and we compare this with the time required in order to achieve exposure of the fracture with other surgical approaches. The second analyzed factor is the incidence and severity of complications, as well as the frequency thereof. Thirdly, we analyze the functional and esthetic result of the use of the transconjunctival approach, and we present the individual complications in the submitted case report. In the analyzed cohort of patients, we selected the most common type of fracture requiring a transconjunctival approach for the purpose of comparing the operating time necessary for the visualization of the fracture line of the infraorbital rim. This concerned patients with an isolated fracture of the zygomaticomaxillary complex, in cases where open repositioning had been indicated, with subsequent three-point internal fixation of the fragments. We defined the time recorded in the operating protocol, from the beginning of the skin incision to the last suture, as the operating time. Due to the absence of regular clinical use of another transcutaneous approach to the infraorbital rim, we compared the operating times in patients on whom a transconjunctival approach was used together with lateral canthotomy, supraorbital transcutaneous approach and intraoral approach via the upper vestibule. From the observed cohort we excluded patients who in addition to an isolated fracture of the zygomaticomaxillary complex also had other affiliated injuries of the facial skeleton. We divided the patients with a fracture of the zygomaticomaxillary complex indicated for open repositioning and three-point fixation (total 17 patients) into two groups, according to the used surgical approach. The first group comprised patients with a transconjunctival approach (TCA) together with lateral canthotomy (LC) and intraoral (i.o.) approach via the upper vestibule. The second subgroup comprised patients with a transconjunctival approach (TCA) simultaneously with a supraorbital (supraorbit) approach and an intraoral (i.o.) approach via the upper vestibule. The first group (TCA + LC + i.o.) consisted of 9 patients, and the second group (TCA + supraorbit + i.o.) consisted of 8 patients. The average operating time in the first group, with the use of a transconjunctival approach and lateral canthotomy with i.o. approach was 143 minutes (Graph 1). In the second group, in which we substituted lateral canthotomy with a supraorbital approach, the average operating time was 160 minutes (Graph 2). The difference in the average operating times between the first and second subgroups represents 17 minutes in favor of the approach with the use of lateral canthotomy (TCA + LC + i.o.). The two groups we compared were small, but the stated difference may correspond at least referentially to the time required for the preparation and closure of the supraorbital approach. On the basis of the analysis of our cohort of patients operated on over the course of 4 years, we can state that lateral canthotomy with three-point fixation of a fracture of the zygomaticomaxillary complex does not fundamentally prolong the surgical procedure.

Over the course of 4 years, out of 89 patients and 103 transconjunctival approaches we recorded a problem-free postoperative course in 84 patients (94.4%) and 98 transconjunctival approaches, which represents a success rate of 95.1%. In the cohort we specifically recorded 2 perioperative complications in the sense of iatrogenic surgical perforation of the lower eyelid, and in 3 cases of use of the transconjunctival approach we recorded later complications in the sense of ectropion and entropion of the lower eyelid. We observed ectropion of the lower eyelid in 1 patient, which represents 0.97% of cases. We observed entropion of the lower eyelid in 2 cases, which represents 1.94% of cases. Reoperation was not necessary in any of the cases of later complications, and all the complications subsided spontaneously during the course of conservative treatment. We present the esthetic result of the use of a transconjunctival approach and lateral canthotomy in a case report (Fig. 9–12).

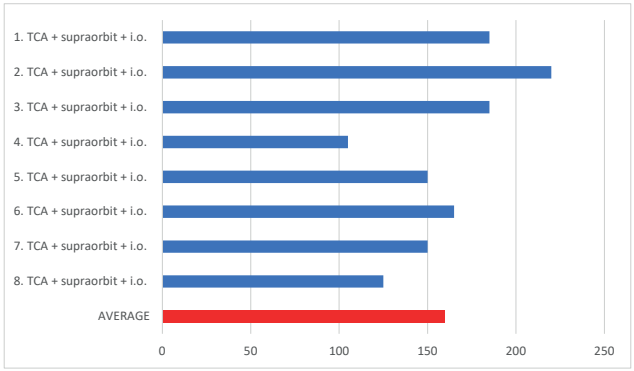


Graph 1. Operative time in minutes, group 1. 3-point fixation of zygomatic complex fracture

TCA – transconjunctival approach
LC – lateral canthotomy
i.o. – intraoral approach

DISCUSSION

Adequate open repositioning and osteosynthesis of skeletal fractures in general is conditioned by sufficient visualization of the fracture lines. In the traumatology of the skull, vertebrae, pelvis and limbs, in the majority of cases a direct transcutaneous approach above the fracture line is used. In surgical treatment of fractures of the facial skeleton, in addition to sufficient visualization it is also important to ensure the resulting cosmetic effect and preservation of function. In the case of absence of a lacerating wound in the infraorbital region, fractures of the infraorbital rim and orbital floor are an example of a continually ongoing professional discussion concerning the most appropriate surgical approach. An ideal surgical approach should provide sufficient scope for visualization of the fracture lines with a minimal percentage of complications, in addition to which it should guarantee an optimal cosmetic result, and shorten (or at least not prolong) the operating time.



Graph 2. Operative time in minutes, group 2. 3-point fixation of zygomatic complex fracture

TCA – transconjunctival approach
supraorbit – supraorbital skin approach
i.o. – intraoral approach

At several maxillofacial surgery centers, over the course of the last two decades the preference has increased for a transconjunctival approach via the conjunctiva of the lower eyelid in the treatment of fractures in which the exposure of the infraorbital rim is necessary. This is due to the complete absence of skin scarring on the face and the possibility of lateral and medial extension by means of a minimal skin incision, as well as its short operating time and good scope of surgical exposure of the infraorbital rim, with a low level of postoperative complications. Even despite the lack of facial scarring, the transconjunctival approach is not the method of first choice for all authors due to the potential postoperative complications which may ensue in the region of the lower eyelid, and some centers or authors continue to use primarily transcutaneous approaches to the infraorbital rim. In the professional literature we have publications on larger cohorts of patients available, in which the authors analyzed the degree of complications ensuing upon different approaches to the infraorbital rim and the orbital floor. In the publication by Al-Moraissi et al. 2018 [3], a transconjunctival approach significantly reduced the incidence of ectropion of the lower eyelid in comparison with a subciliary approach. In comparison with a subtarsal approach, it also reduced the incidence of ectropion, but without a statistically significant difference. The difference in

Figure 9. Transconjunctival approach and lateral canthotomy

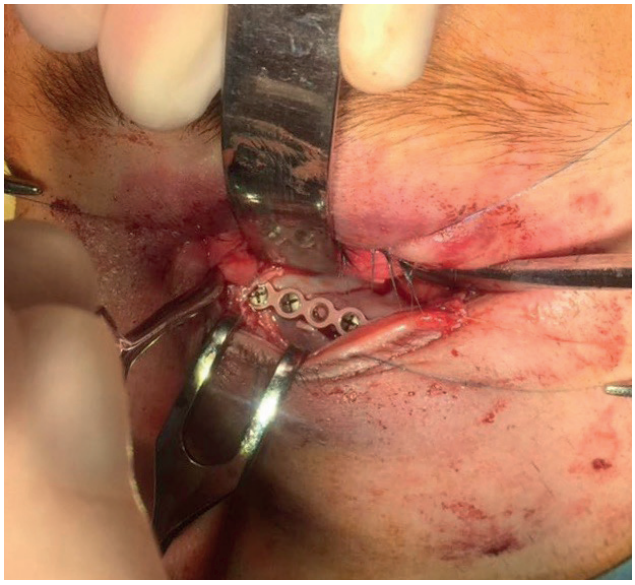


Figure 10. Infraorbital rim fracture repair with miniplate

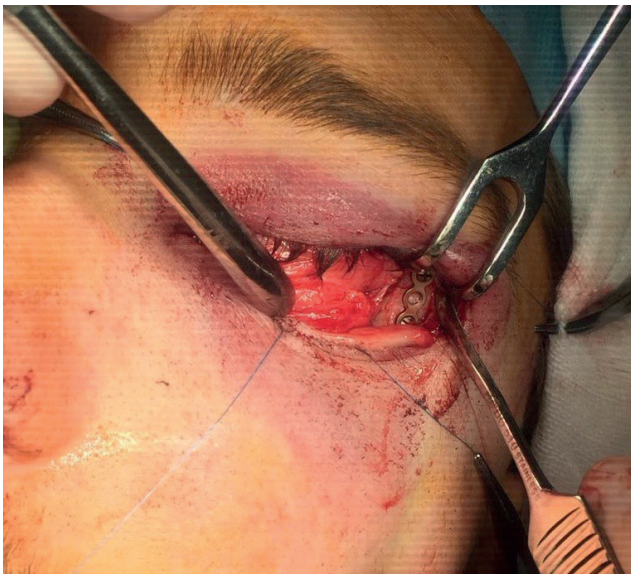


Figure 11. Lateral orbital rim fracture repair with miniplate

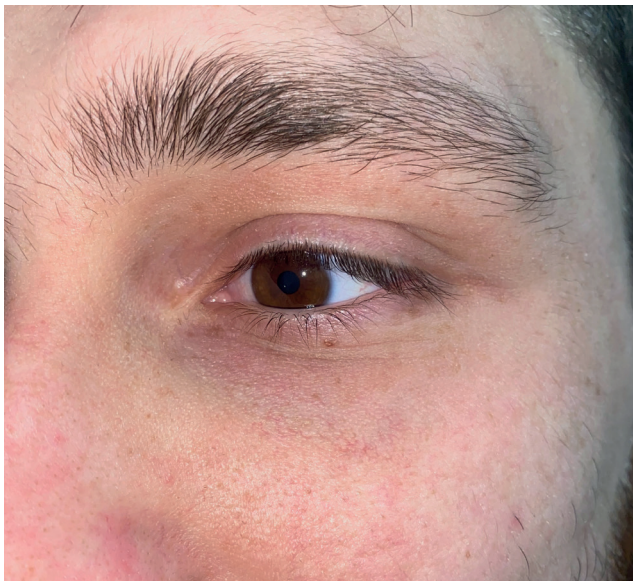


Figure 12. Follow up, 3 years after transconjunctival approach and lateral canthotomy

incidence of ectropion upon a comparison of a subciliary with a subtarsal approach and a subtarsal with an infraorbital approach was not statistically significant. In the case of entropion of the lower eyelid, the use of a subciliary approach statistically significantly reduced the incidence of entropion in comparison with a transconjunctival approach [4]. The team of authors Pausch et al. [5] state in their 2015 study an incidence of entropion of the lower eyelid following a transconjunctival approach in 2.5% of cases, and their results are in accordance with the results of other authors [6-10]. In the case of incidence of ectropion following a transconjunctival approach, the authors state an overall reduction in the number of cases of ectropion of the lower eyelid, and these findings are also comparable with studies conducted by other authors [6-8]. Following the analysis of our cohort of 103 cases of use of a transconjunctival approach, we recorded perioperative complications in 1.94% of cases (2 patients), and postoperative complications in 2.91% (3 patients): we observed ectropion of the lower eyelid in 0.97% of cases (1 patient) and entropion of the lower eyelid in 1.94% of cases (2 patients). All the postoperative complications spontaneously regressed during the observation period. The single postoperative case of ectropion of the lower eyelid in our cohort spontaneously corrected itself during the course of the second postoperative month. The majority of authors concur that entropion of the lower eyelid is a more serious complication due to irritation of the cornea by inverted eyelashes, which is associated with more pronounced subjective complaints on the part of the patient. The surgical correction of entropion itself is also a more complicated procedure in comparison with the surgical treatment of ectropion. In the two cases of entropion recorded in our cohort, the physiological position of the lower eyelid was restored without surgical intervention during the course of the first six months following the procedure. Our observations are comparable with the results of foreign publications on the transconjunctival approach in larger cohorts of patients, and we may consider the transconjunctival approach to be a safe surgical procedure a low incidence of complications [3]. The length of the operating time necessary for visualization of the fracture line of the infraorbital rim and orbital floor depends not only on the selected approach, but also on the experience of the surgeon. For an analysis of the length of the operating time of a transconjunctival approach and lateral canthotomy we selected an isolated fracture of the zygomaticomaxillary complex. We utilized the option of direction comparison of the operating time upon the use of lateral canthotomy with a transcutaneous supraorbital approach, which is used more frequently in clinical practice for the visualization of the lateral orbital rim. It ensues from our results that a transconjunctival approach, either separately or with extension by lateral canthotomy, does not prolong the operating time. In the foreign literature a number of authors such as De Riu et al. 2008 [11] state that in the hands of an experienced surgeon, a transconjunctival approach with lateral canthotomy in fact shortens the operating time. The use of a transconjunctival approach enables the complete elimination of skin scarring in the infraorbital region and on the lower eyelid [12]. A successful outcome of the use of a transconjunctival approach is a good cosmetic result of open surgical treatment, the impossibility of distinguishing the original localization of the injury to the facial skeleton,

and the absence of scarring and any external signs of surgical intervention.

CONCLUSION

On the basis of the results of the analysis of our cohort of patients, we may consider the transconjunctival approach to represent a safe surgical technique associated with a low risk of complications, which either independently or in connection with lateral canthotomy does not prolong the operating time, and thanks to the mucosal incision of the conjunctiva of the lower eyelid completely eliminates skin scarring on the face. The analyzed results at our center during the period from December 2017 to December 2021 are comparable with the results of foreign authors and centers with larger cohorts of patients [3].

REFERENCES

1. Tenzel RR, Miller GR. Orbital blow-out fracture repair, conjunctival approach. Am J Ophthalmol. 1971 May;71(5):1141-1142. doi: 10.1016/0002-9394(71)90592-7
2. Tessier P. The conjunctival approach to the orbital floor and maxilla in congenital malformation and trauma. J Maxillofac Surg. 1973 Mar;1(1):3-8. doi: 10.1016/s0301-0503(73)80005-0
3. Al-Moraissi E, Elsharkawy A, Al-Tairi N, et al. What surgical approach has the lowest risk of the lower lid complications in the treatment of orbital floor and periorbital fractures? A frequentist network meta-analysis. J Craniomaxillofac Surg. 2018 Dec;46(12):2164-2175. doi: 10.1016/j.jcms.2018.09.001
4. Al-Moraissi EA, Thaller SR, Ellis E. Subciliary vs. transconjunctival approach for the management of orbital floor and periorbital fractures: A systematic review and meta-analysis. J Craniomaxillofac Surg. 2017 Oct;45(10):1647-1654. doi: 10.1016/j.jcms.2017.07.004
5. Pausch NC, Sirintawat N, Wagner R, Halama D, Dhanuthai K. Lower eyelid complications associated with transconjunctival versus subciliary approaches to orbital floor fractures. Oral Maxillofac Surg. 2016 Mar;20(1):51-5. doi: 10.1007/s10006-015-0526-1
6. Raschke GF, Rieger UM, Bader RD, Schaefer O, Guentsch A, Schultze-Mosgau S. Transconjunctival versus subciliary approach for orbital fracture repair-an anthropometric evaluation of 221 cases. Clin Oral Investig. 2013 Apr;17(3):933-942. doi: 10.1007/s00784-012-0776-3
7. Ridgway EB, Chen C, Colakoglu S, Gautam S, Lee BT. The incidence of lower eyelid malposition after facial fracture repair: a retrospective study and meta-analysis comparing subtarsal, subciliary, and transconjunctival incisions. Plast Reconstr Surg. 2009 Nov;124(5):1578-1586. doi: 10.1097/PRS.0b013e3181babb3d
8. Salgarelli AC, Bellini P, Landini B, Multinu A, Consolo U. A comparative study of different approaches in the treatment of orbital trauma: an experience based on 274 cases. Oral Maxillofac Surg. 2010 Mar;14(1):23-27. doi: 10.1007/s10006-009-0176-2
9. Ridgway EB, Chen C, Lee BT. Acquired entropion associated with the transconjunctival incision for facial fracture management. J Craniofac Surg. 2009 Sep;20(5):1412-1415. doi: 10.1097/SCS.0b013e3181aee3ee
10. Yamashita M, Kishibe M, Shimada K. Incidence of lower eyelid complications after a transconjunctival approach: influence of repeated incisions. J Craniofac Surg. 2014 Jul;25(4):1183-1186. doi: 10.1097/SCS.0000000000000836
11. De Riu G, Meloni SM, Gobbi R, Soma D, Baj A, Tullio A. Subciliary versus swinging eyelid approach to the orbital floor. J Craniomaxillofac Surg. 2008 Dec;36(8):439-442. doi: 10.1016/j.jcms.2008.07.005
12. Bronstein JA, Bruce WJ, Bakhos F, Ishaq D, Joyce CJ, Cimino V. Surgical Approach to Orbital Floor Fractures: Comparing Complication Rates Between Subciliary and Subconjunctival Approaches. Craniomaxillofac Trauma Reconstr. 2020 Mar;13(1):45-48. doi: 10.1177/1943387520904893