Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

Ocular Complications of Strabismus Surgery at a Tertiary Eye hospital, Nepal

Rojeeta Parajuli

rojita.parajuli@tilganga.org

Tilganga Institute of Ophthalmology

Ang J Lama

Tilganga Institute of Ophthalmology

Namrata Gupta

Tilganga Institute of Ophthalmology

Manish Poudel

Tilganga Institute of Ophthalmology

Srijana Adhikari

Tilganga Institute of Ophthalmology

Research Article

Keywords: Complications, Strabismus Surgery, Tertiary Eye hospital, Nepal

Posted Date: April 15th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-9263766/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License.
Read Full License

Additional Declarations: No competing interests reported.

Abstract

Aim

To find out the complications of first horizontal strabismus surgery at a tertiary eye hospital in Nepal

Methods

194 patients with follow-up periods of 6 weeks to 3 months were retrieved from 2017 to 2020 from the electronic medical record. were reviewed retrospectively at Tilganga Institute of Ophthalmology (TIO)

Results

The majority of the patients were between the ages of 6 and 18 years old (59.6%), followed by those aged 18-53 years (40.4%). There was a female preponderance.

Out of 194 patients, 19 (9.8%) persons (eyes: 23, 11.9%) developed complications. Five patients had conjunctival wound dehiscence. Four patients developed conjunctival cysts, raised IOP was seen in four patients. Four patients developed postoperative diplopia. Three had corneal epithelial defects, two had corneal dellen, and a single patient had suture granuloma.

Conclusion

Common complications, such as conjunctival injection, scarring, dellen, cysts, and pyogenic granulomas, usually resolve with conservative management over time. Vision-threatening complications are rare after strabismus surgery. Damage to ocular structures can be prevented by employing meticulous surgical techniques. Close monitoring and vigilant postoperative care are necessary.

Introduction

Fortunately, ocular complications in strabismus surgery are uncommon and usually treatable. Complications are unavoidable results of any procedure, including strabismus surgery.[1]

Complications can occur in any ocular surgery including strabismus surgery. High-quality suture material, enhanced visualization with operating loupes and microscopes, general anesthesia and with the use of spatulated needle, have improved the safety and efficacy of eye muscle surgery.[2] Since many of the rare complications of strabismus surgery are not encountered by a large number of ophthalmologists and it is necessary to know the incidence of such complications from published studies in order to counsel the patients about the risks. According to the American Academy of Ophthalmology (AAO), physicians must disclose any risks or potential common complications which reasonably influence the patient's decision to accept the proposed procedure.[3] In this study we aimed to evaluate the identified major ocular complications of strabismus surgery at the Department of Pediatric Ophthalmology and Strabismus. Therefore, the purpose of this study was to find out the complications

of strabismus surgery in our hospital and to incorporate in our own clinical experience where appropriate.

Methodology

The same data set used for the study of “Outcome of Horizontal Strabismus Surgery and factors influencing surgical success” was analyzed.[4] Complete records of 194 patients with follow-up period ranging from 6 weeks to 3 months were retrieved from the electronic medical record between 2017 to 2020 were reviewed retrospectively. Patients with restrictive muscle disease, paralytic squints, and vertical squints were excluded from the study. Ethical approval was obtained from institutional review committee of TIO (ref no: 16/2021). The study was carried out in accordance with the Declaration of Helsinki.

Clinical Evaluation:

Snellen chart and LEA symbols were used for visual acuity measurement. Extraocular muscle function were examined in the nine cardinal positions of gaze. Prism bar cover test at both near and distance with and without glasses was used to measure the angles of deviation. Modified Krimsky test was used to measure the angle of deviation for patients with poor vision. Titmus fly test and worth-four dot test. were used for stereopsis, and binocular vision evaluation respectively. For the amblyopic patients patching therapy was advised before surgery. In all patients a slit lamp examination of the anterior segment and a dilated fundus examination were performed.[4] General or local anesthesia was used for surgeries. Marshall Parks’ formula was used for guidelines of planning surgical measurement for esotropia and exotropia .[4]

Surgical Planning and Surgical Treatment:

Local anesthesia was used for most of the patients while for younger patients general anesthesia was used. Horizontal muscles (lateral rectus or medial rectus) were grasped using a muscle hook, after making fornix-based conjunctival incision, and recession or resection surgery was performed based on the type of strabismus. 6 – 0 absorbable Vicryl suture with a double spatula needle was used for suturing the muscle to the sclera followed by conjunctival closure using 8 – 0 Vicryl suture.[4]

Post-operative Follow up:

Patients were examined after surgery on the first postoperative day, at one week, and six weeks to three months. An eye-drop combination of dexamethasone and chloramphenicol six times daily and chloramphenicol ointment at bed time for one week and were tapered over one month.

Statistical Analysis

Data Entry and cleaning were done in MS Excel and data analysis was performed using IBM SPSS V 20. Descriptive analysis was done using number, percentage, mean and range. Pie, bar diagram was used for graphical representation.

Results

Nineteen (9.8%) patient among 194 squint surgeries had complication, which were enrolled in the study. The average age (SD) of the participants was 21.5 (11.2) years, with majority having age group of 16–25 years (36.8%), followed by 7–15 years (21.1%). There was a male preponderance, i.e, 12 (63.2%), as shown in Table 1

Table 1
Age and Gender distribution among Complication (n = 19)

Variable	Count	Percentage
Gender		
Male	12	63.2
Female	7	36.8
Total	19	100.0
Age group (Years)		
Up to 6	2	10.5
7–15	4	21.1
16–25	7	36.8
26–35	3	15.8
36–45	2	10.5
46–55	1	5.3
Total	19	100.0

Out of 194 patients, 23 patients had complications. as shown in Fig. 1.

Among them, two patients had corneal dellen, which healed after frequent use of lubricating eye drops and antibiotics. One dellen patient developed epithelial defect in follow up. Three patients had corneal epithelial defects, which healed after eye patching with antibiotics. Five patients had conjunctival wound dehiscence; wound re-suturing was done. After re-suturing, one patient developed a temporal conjunctival cyst at the one month follow up. Four patients had conjunctival cysts, out of which three were children. Two patients had temporal cyst and two had nasal cyst. One patient had undergone conjunctival re-suturing on first postoperative day. Raised intra ocular pressure (IOP) was seen in four

patients which was eventually controlled after stopping steroid eye drop and initiating anti-glaucoma medicine. Among them, one had suture granuloma, which improved after removal of suture, and with antibiotic and steroid eye drop. Four patients had diplopia after surgery, out of which two were children and two were adult. In first case of diplopia, both eye medial rectus recession was performed for esotropia, (58PD base out at near, 50PD base out at distance, and right eye hypertropia of 8PD at near and 10PD at distance). At the one-month postoperative period, he had residual esotropia of 10PD base out with right eye hypertropia of 4PD at near and distance, diplopia at near, horizontal diplopia with maximum separation of image in levoelevation and depression. In second case of diplopia, left eye lateral rectus recession and medial rectus resection were performed for left eye exotropia 50PD Base In at near and 45PD base in at distance and, right eye hypertropia 10PD at distance, 6PD at near, with nystagmus and amblyopia. At the one- month post-operative period, he had residual exotropia of 12PD base in at near and distance, along with diplopia. In third case, left eye lateral rectus recession and medial rectus resection with inferior transposition of lateral rectus and medial rectus tendon by 4mm was done for Left eye exotropia with hypertropia (44PD Base In at near and distance, and 27PD left eye hypertropia at near). In the post-operative period, he had esophoria of 15 BO at near and 12 BO at distance; he had fusion at near and diplopia at distance, and Left eye hypertropia of 4PD. He was comfortable after using prism glasses. In fourth case, Left eye Medial Rectus Recession and Lateral Rectus Resection was done for 45 Base Out, Right eye hypertropia of 12 PD. In one month postoperative period, he had consecutive XT of 15PD Base In with diplopia; he was also comfortable after prism glass, as shown in Table 2.

Table 2
Descriptions and outcomes of complications

Descriptions of complications (Age)	Descriptions of surgery	Outcome
Corneal dellen (20yrs,26yrs)	LR Recession + MR Resection	Dellen healed in 1week follow up with Frequent lubricating eye drop and antibiotics
Corneal epithelial defect (26yrs,27yrs,28yrs)	All had LR Recession + MR Resection	Corneal epithelial defect healed after 24 hours eye pad with ointment antibiotic
Conjuctival wound dehiscence (12yrs,16yrs,20yrs, 43yrs, 50yrs,)	One had MR Recession and LR esection	All patients underwent resuturing,
	Two patient had LR Recession and MR Resection	One patient develops temporal conjunctival cyst after resuturing
	Two patient had BLR	One patient needs cyst removal
Suture granuloma (25yrs)	OD LR Recession and MR Resection	Suture removed, patient improved after antibiotics and steroid eye drop
Conjuctival cyst (6yrs,10yrs,17yrs,20yrs,)	Two patients had MR Recession and LR resection	Two patients had temporal conjuctival cyst
	Two patients had LR Recession and MR Resection	Two patients had nasal conjunctival cyst
	One had BMR	Two Patients had H/O re suturing
		One patient had cyst removal
		Three had small cyst patients were comfortable
Steroid responder (13yrs,25yrs,25yrs,36yrs)	All had LR Recession and MR Resection	IOP controlled with anti glaucoma medications, one patient had suture granuloma
Diplopia (10yrs, 17yrs,26yrs,24yrs)	1.Both eye Medial Rectus Recession(58BO at Near, 50 BO at distance, R/L 8 at near, 10 at distance)	Residual esotropia of 10 BO R/L 4, diplopia at near and distance, at near,horizontal diplopia with maximum separation of image in levoelevation and depression 2 inches.
		Didn’t come for f/u
	2.Left eye Lateral rectus Recession and Medial Rectus Resection(50 BI at near, 45 BI at	Residual exotropia of 12 BI at near and distant,, EOM

Descriptions of complications (Age)	Descriptions of surgery	Outcome
	distance, 10 R/L at distance, 6 R/L at near) and nystmagus	Abduction limitation, didn't come for f/u
	3. Left eye Lateral rectus Recession and Medial Rectus Resection (44 BI at near and distance and 27 L/R), with inferior transposition of Lateral rectus and Medial rectus tendon of 4mm	Esophoria of 15 BO at near, and 12 BO at distance, 4 L/R, Fusion at near, diplopia at distance
		Prism glass(7BO, 7BO), OS abduction limitation
	4. Left eye Medial Rectus Recession and Lateral Rectus Resection (45 BO, R/L 12)	Consecutive XT 12 BI, diplopia, comfortable with Prism glass(6BI, 6BI)

Discussion

Vision-threatening complications are rare following strabismus surgery. Common complications, such as conjunctival injection, scarring, dellen, cysts, and pyogenic granulomas, usually resolve with conservative management over time.

A study done in Turkey reported that the corneal dellen was the most frequently detected complication of strabismus surgery, and all patients had undergone surgery using a limbal approach. Therefore, they suggested careful attention to any excess conjunctiva near the limbus and recommended postoperative examination within one week to prevent possible corneal complications[1]. Study done at Boston USA, reported that Corneal dellen develop in approximately 3.2 – 4.3% of strabismus surgeries overall. Whereas in our study, two (8.7%) patients developed corneal dellen. However in medial rectus reoperations and rectus muscle transpositions ,the incidence is significantly higher.[2] The incidence of dellen increases with the limbal approach as stated by Tesler and Urist.[5] But in our study all patient had under gone surgery by fornix approach.

There is greater desiccation in limbal approach compared to the more remote non-limbal approach. Furthermore, because resections involved more tissue near the limbus than recessions, they result in higher incidence of dellen. Smooth closure of the limbal wound and trimming of excess limbal conjunctiva are recommended to prevent tissue elevation near the limbus.[6]

In this study pyogenic granuloma was identified in one patient (4.3%), later on IOP was found to be raised. This finding is slightly higher compared to the study conducted in Spain where it was 2.1%.[7] With topical corticosteroid therapy, the most pyogenic granulomas resolved completely; however when conservative management fails, surgical excision is highly effective.[8] In our study four (17.4%) patients had conjuctival cysts out of which three were children and cyst were developed at muscle reattachment site, which was similar to the study done by Guadilla AM.[5] Careful retraction of tissues may prevent this

complication, which had been suggested by different surgeons. Persistent cases often require surgical excision, although spontaneous resolution may occasionally occur.[5]

In our study, four patients (17.4%) developed diplopia after surgery. Among them, two were children and two were adult. Two patients had residual exotropia, residual esotropia, and other two had consecutive esotropia, consecutive exotropia. When the postoperative alignment is unsatisfactory, diplopia occurs most commonly after strabismus surgery.[9] This may result from overcorrection in patients with no preoperative diplopia who cannot adapt to the new deviation, or from under correction in visually mature patients with preoperative diplopia due to acquired strabismus.[10,11] Following superior oblique weakening procedures, torsional diplopia may occur, which can be profound and difficult to correct.[12] Even after successful surgical realignment, postoperative diplopia may occur paradoxically.[9] Anomalous retinal correspondence (ARC) may develop in patients with longstanding constant deviations, in which non-corresponding retinal elements are functionally linked to allow for single binocular vision in the setting of manifest strabismus.[13] Successful surgical realignment in such patients may lead to paradoxical diplopia if the patient cannot fuse the images or suppresses one of them. Diplopia in these cases is usually transient, but rarely could be intractable. In a retrospective review done by Kushner in which 424 adult patients with constant strabismus without diplopia who underwent prism testing prior to strabismus surgery, the risk of persistent diplopia was only 0.7%, while transient diplopia was common in patients who reported diplopia preoperatively with prism testing. The presence of diplopia had a 2% positive predictive value for persistent diplopia, while the absence of diplopia on preoperative prism testing had a 100% negative predictive value. A positive test is not an indication to cancel surgery, but preoperative prism test can be reassuring to patients. Sensory testing can also help to identify the presence of ARC prior to surgery, and such patients should be warned that intractable postoperative diplopia is a possibility, although a rare complication.[13]

In this study, 4(17.4%) patients had raised intraocular pressure (IOP), which was controlled after discontinuing steroid eye drops and initiation of anti-glaucoma medication. Ketorolac sodium was used as an alternative treatment. Similarly, a transient and clinically insignificant raise in IOP within the first 2 weeks has been observed in the majority of patients, which is unlikely to cause any long-term harm.[14]

A shorter course of postoperative steroid drops are recommended for in high-risk patients, such as children and those with glaucoma risk factors. As an alternative, diclofenac drops may be used; however, there are increasing reports of corneal melt associated with their use.[14–17] Study done in UK reported that most common complication was perforation of the globe 19 [0.08%]), followed by a suspected slipped muscle 16(0.067%), severe infection 14(0.06%), scleritis 6(0.02%), and lost muscle 5(0.02%). Not such complications were encountered in our study.[18] The limitation of this study is small number of complications, so that the comparisons could not be performed.

Conclusion

Ocular complications of strabismus surgery are uncommon, and generally treatable. The common complications observed were wound dehiscence, raised intraocular pressure, diplopia, and conjunctival cyst and among them, wound dehiscence was the most frequent. Conjunctival dellen, cysts, and pyogenic granulomas usually improve gradually improve with conservative treatment. Meticulous surgical techniques, close monitoring and vigilant postoperative care help prevent damage to ocular structures.

Declarations

Ethics approval and consent to participate

Ethical approval was granted from Tilganga Institute of Ophthalmology-Institutional Review Committee (TIO-IRC). Since this is a retrospective study, written consent from all the participants' were waved.

Consent for publication

Not applicable.

Availability of data and materials

Data will be provided upon request

Conflicts of interest

None

Funding

None

Authors' contributions Rojeeta Parajuli: Concept design, Ovearall litreture review and manuscript writing, **Ang J Lama**: Assist in manuscript writing, Assist in litreture review, **Namrata Gupta:** Assist in manuscript writing, Assist in litreture review, **Manish Poudel:** Data management and analysis, Assist in manuscript writing, **Srijana Adhikari:** Concept design, Assist in manuscript writing.

Acknowledgements

None

References

1. Yurdakul NS, Koç F. (2014) 'Ocular Complications of Strabismus Surgery'. *Surgical Science*, 05(09), pp. 397–402. [online] Available from: http://www.scirp.org/journal/doi.aspx?DOI=10.4236/ss.2014.59064 (Accessed 10 October 2025).

2. Wan MJ, Hunter DG. (2014) ‘Complications of Strabismus Surgery: Incidence and Risk Factors’. *Seminars in Ophthalmology*, 29(5–6), pp. 421–428. [online] Available from: https://www.tandfonline.com/doi/full/10.3109/08820538.2014.959190 (Accessed 10 October 2025).
3. (2011) *Practice Guidelines for Informed Consent*, Guideline, American Academy of Ophthalmology, Francisco S, [online] CA. Available from: https://www.aao.org/assets/9d4edb52-14e0-48d2-9e6c-7d5197c37958/636102302610070000/practice-guidelines-for-informed-consent-dec-2011-pdf
4. Parajuli R, Adhikari, Srijana, Poudel, Manish, Naluria H et al. (2024) ‘Outcome of Horizontal Strabismus Surgery and Factors Influencing Surgical Success’. *Nepalese Journal of Ophthalmology*, 16(1), pp. 5–12. [online] Available from: https://www.nepjol.info/index.php/NEPJOPH/article/view/50291 (Accessed 10 October 2025).
5. Guadilla A, De Maria P, Gómez, Merino P, Franco G. (2011) ‘Conjunctival Cysts as a Complication After Strabismus Surgery’. *Journal of Pediatric Ophthalmology & Strabismus*, 48(5), pp. 298–300. [online] Available from: https://journals.healio.com/doi/10.3928/01913913-20100818-02 (Accessed 10 October 2025).
6. Tessler HH, Urist MJ. (1975) ‘Corneal dellen in the limbal approach to rectus muscle surgery.’ *British Journal of Ophthalmology*, 59(7), pp. 377–379. [online] Available from: https://bjo.bmj.com/lookup/doi/10.1136/bjo.59.7.377 (Accessed 10 October 2025).
7. Espinoza GM, Lueder, Gregg T. (2005) ‘Conjunctival Pyogenic Granulomas after Strabismus Surgery’. *Ophthalmology*, 112(7), pp. 1283–1286. [online] Available from: https://linkinghub.elsevier.com/retrieve/pii/S0161642005002940 (Accessed 10 October 2025).
8. Khan AO, Al-Katan H, Al-Baharna I, Al-Wadani F. (2007) ‘Infected epithelial inclusion cyst mimicking subconjunctival abscess after strabismus surgery’. *Journal of American Association for Pediatric Ophthalmology and Strabismus*, 11(3), pp. 303–304. [online] Available from: https://linkinghub.elsevier.com/retrieve/pii/S1091853106004381 (Accessed 10 October 2025).
9. Kushner BJ. (2002) ‘Intractable Diplopia After Strabismus Surgery in Adults’. *Archives of Ophthalmology*, 120(11), p. 1498. [online] Available from: http://archopht.jamanetwork.com/article.aspx?doi=10.1001/archopht.120.11.1498 (Accessed 10 October 2025).
10. Pratt-Johnson JA, Tillson G. (1984) ‘Suppression in strabismus–an update.’ *British Journal of Ophthalmology*, 68(3), pp. 174–178. [online] Available from: https://bjo.bmj.com/lookup/doi/10.1136/bjo.68.3.174 (Accessed 10 October 2025).
11. Simon JW, Paskowski JR. (1994) ‘Intractable Diplopia After Overcorrection of Vertical Strabismus’. *American Journal of Ophthalmology*, 117(5), pp. 675–676. [online] Available from: https://linkinghub.elsevier.com/retrieve/pii/S0002939414700820 (Accessed 10 October 2025).
12. Santiago AP, Rosenbaum AL. (1997) ‘Grave complications after superior oblique tenotomy or tenectomy for brown syndrome’. *Journal of American Association for Pediatric Ophthalmology and*

Strabismus, 1(1), pp. 8–15. [online] Available from: https://linkinghub.elsevier.com/retrieve/pii/S1091853197900173 (Accessed 10 October 2025).

13. Castleberry C, Arnoldi K. (2003) 'Predicting Postoperative Paradoxical Diplopia'. *American Orthoptic Journal*, 53(1), pp. 88–97. [online] Available from: https://www.tandfonline.com/doi/full/10.3368/aoj.53.1.88 (Accessed 10 October 2025).
14. Dadeya S. and Kamlesh (2002) 'Comparative Evaluation of Diclofenac and Dexamethasone Following Strabismus Surgery'. *Journal of Pediatric Ophthalmology & Strabismus*, 39(3), pp. 166–168. [online] Available from: https://journals.healio.com/doi/10.3928/0191-3913-20020501-08 (Accessed 10 October 2025).
15. Khan HA, Amitava AK. (2007) 'Topical diclofenac versus dexamethasone after strabismus surgery: A double-blind randomized clinical trial of anti-inflammatory effect and ocular hypertensive response'. *Indian Journal of Ophthalmology*, 55(4), p. 271. [online] Available from: https://journals.lww.com/10.4103/0301-4738.33039 (Accessed 10 October 2025).
16. Lin JC, Rapuano CJ, Laibson PR, Eagle RC, Cohen EJ. Corneal melting associated with use of topical nonsteroidal anti-inflammatory drugs after ocular surgery. Archives Ophthalmol (Chicago Ill : 1960). 2000;118(8):1129–32.
17. Snir M, Axer-Siegel R, Friling, Ronit and, Weinberger D. (2000) 'Efficacy of diclofenac versus dexamethasone for treatment after strabismus surgery'. *Ophthalmology*, 107(10), pp. 1884–1888. [online] Available from: https://linkinghub.elsevier.com/retrieve/pii/S016164200000350X (Accessed 10 October 2025).
18. Bradbury JA, Taylor RH. (2013) 'Severe complications of strabismus surgery'. *Journal of American Association for Pediatric Ophthalmology and Strabismus*, 17(1), pp. 59–63. [online] Available from: https://linkinghub.elsevier.com/retrieve/pii/S1091853112004132 (Accessed 10 October 2025).

Figures

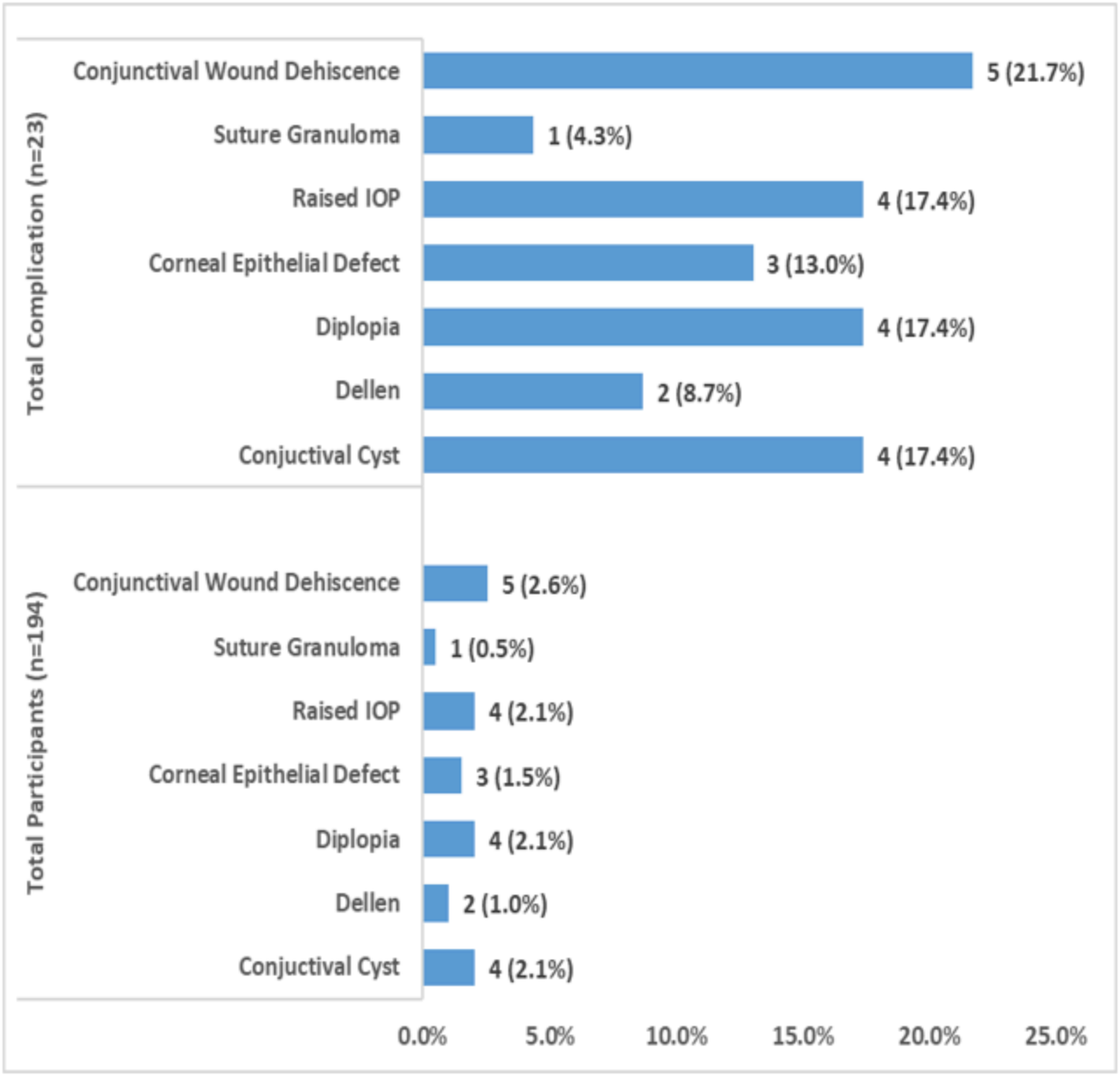


Figure 1

Descriptions of complications