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From the Editor's Desk

Dear friends,

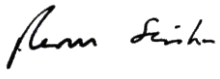
A very happy new year to all the readers. New year brings new resolutions, new expectations and new commitments. We promise to eat healthy, exercise frequently and take care of ourselves to lead a more meaningful life, while striving to be a better clinician as well as a better person as each new day approaches. One should not give up the opportunity and will to learn, from others as well as from our own mistakes and experiences. Keeping that in mind, We shall also strive to share new knowledge along with safe practices in the field of ophthalmic anaesthesia and ophthalmology.

The year 2022 brought with it a wonderful conference in Madurai, all thanks to the organisers who ensured that it was filled with a splendid academic feast and excellent hospitality, and we hope to carry this forward in the coming years as well.

As we all know, Safety is of utmost importance in the field of medicine. In this issue, Safety associated with the use of 5% phenylephrine eye drops for cataract surgery has been discussed. Management of hypersensitivity reaction due to hyaluronidase in peribulbar block has also been highlighted. An article about accidental ingestion of an instrument during eye surgery has been included to make the readers aware of this possibility, so that proper precautions can be taken.

Patients, of various age groups, with various syndromes require elective or emergency surgeries. Anaesthetic problems and management related to eye surgeries in patients with paediatric syndromes with craniofacial anomalies has been discussed in this issue. More than 70% of ophthalmic surgeries are performed under peribulbar block. One should learn the correct method for its administration, which can be achieved by hands on Simulation training on a mannequin. A real time view mannequin developed for the first time, is explained in detail by the author in this issue.

We hope that this issue not only enlightens all the readers with the new and innovative techniques of anaesthesia administration in ophthalmic surgeries, but also increases their knowledge about management of complications during the procedures.



Dr Renu Sinha

Editor

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Indian Journal of Ophthalmic Anaesthesia

The Official Journal of Association of Indian Ophthalmic Anaesthesiologists

Original Article

Hemodynamic Alterations With 5% Phenylephrine Eye Drops In Normotensive And Hypertensive Patients Undergoing Cataract Surgery: A Prospective Study

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Abstract

Adequate pupillary dilatation is the prerequisite for ophthalmic examination and surgical procedures. Routinely administered topical phenylephrine is said to cause systemic adverse cardiovascular effects.

Aim

Through our study, we intended to determine the hemodynamic effect of topical phenylephrine (5%) in normotensive and hypertensive patients perioperatively.

Method

The study included 450 patients of ASA Gr I and II undergoing cataract surgery under local anesthesia. They were divided into two groups of normotensive and hypertensive (on medication) patients. These patients were administered with only three drops of topical tropicamide and phenylephrine drug at fixed intervals and the hemodynamic [heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP) and mean arterial pressure(MAP)] parameters were monitored perioperatively.

Results

The demographic data were comparable between the groups. We observed slight increase in the mean SBP and MAP in both the groups from the base values and between the groups. The difference was statistically significant but within the permissible limits clinically. Statistically insignificant ($p < 0.05$) variation was observed for mean HR and DBP at various levels from the baseline values and also between the groups. None of the patients in both the groups experienced adverse effects.

Conclusion

Topical phenylephrine (5%) was observed to be safe hemodynamically and effective for pupillary dilatation both in hypertensive and normotensive patients. Avoiding frequent and multiple instillations of the drug and considering hemodynamic monitoring perioperatively is recommended.

Key Words: cataract surgery, mydriasis, phenylephrine, topical, heart rate, blood pressure.

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Introduction

Pupillary dilatation is necessary for patients coming to OPD for ophthalmic examination and for most of the eye surgeries. Phenylephrine hydrochloride and tropicamide is the popular combination used for pupillary dilatation. Tropicamide is a short acting anticholinergic agent used as mydriasis and cycloplegic whereas phenylephrine hydrochloride is a sympathomimetic drug used as mydriatic (without cycloplegia), vasoconstrictor and decongestant. Tropicamide alone cannot provide adequate dilation so the concentration of phenylephrine up to 10% is used in combination. Solutions of 2.5% and 10% of phenylephrine that were used before showed side effects due to systemic absorption, this is why 10% strength was used with caution. Systemic side effects are same as sympathomimetic effects such as tachycardia, arrhythmias, hypertension, headache, sweating, faintness, trembling and pallor.[1] Patients with cataract visiting ophthalmic OPD are above 50 years of age and amongst which 40 % will be with primary hypertension.[2]

The studies that are available in the literature describe about a rise in the blood pressure with topical phenylephrine. The rise in systolic blood pressure (SBP) by 20-40 mmHg and diastolic pressure(DBP) by 10-20mmHg in hypertensive patients with 5% phenylephrine was observed in one study.[1] Whereas, another study mentions about an insignificant increase in blood pressure(BP) both in normotensive and hypertensive patients.[3] There was a need for a larger study with a standardised perioperative procedure and monitoring to reach to a final conclusion about contradictory views.1 In ophthalmic or optometric practice, neither the heart rate (HR) nor the BP is routinely monitored before the administration of topical phenylephrine, which adds to the list of adverse effects of the drug being used. The effect of topical 5% phenylephrine on haemodynamics during the perioperative period was carefully studied in large number of patients (hypertensive and normotensive) undergoing cataract surgery.

Methods and materials

A prospective randomised controlled study was conducted in our hospital after the approval of institutional ethics committee. The study was conducted on 450 patients of ASA Gr I and II who were posted for cataract surgery, between the age of 35-65 years, normotensive and hypertensive (controlled hypertension with BP of < 160/100mm Hg and or on medication) patients and those willing to participate in the study. Patients with complicated cataract, glaucoma, morbid obesity, hypertension (>160 SBP and >100 DBP), secondary hypertension, pregnancy induced hypertension and other cardiovascular diseases were excluded from the study. Those on medications like atropine, βeta blockers and TCA depressants were also not considered. The patients were divided into two groups: **Group I** - 225 normotensive patients. **Group II** - 225 hypertensive patients.

A day prior to the surgery, preoperative visit was made and pre-anesthetic checkup was done. On the day of surgery, patients were checked for basal heart rate (HR) and blood pressure [Systolic Blood Pressure (SBP), Diastolic blood pressure (DBP) and Mean arterial pressure (MAP)] in the supine position in the preoperative room. The commercially available combination of 0.8% w/v tropicamide and 5% w/v phenylephrine was administered to the concerned eye on the lower conjunctival fornix 1 hour before the surgery. The topical instillation was repeated every 15 min for a total of three drops only. A drop of non-steroidal anti-inflammatory agent flubiprofen 0.03% was instilled after each mydriatic drops in all the patients. This is a non mydriatic drug but helps to keep the pupil dilated during surgery. This drug does not affect the results of the study keeps the pupil dilated during surgery. The hemodynamic data were recorded by the electronic monitor and the same monitor was used till the end of the study. Observed data were noted at 5, 10, 15, 20, 30 min and at 1, 2 and 3 hrs.

Minimum of 6mm of pupillary dilation was considered adequate for the study and no extra irrigation with adrenaline was used to keep the pupil mydriatic. Once the adequate pupillary dilation was achieved, peribulbar block was given with a fixed combination dose of lidocaine and bupivacaine without any adrenaline for all the patients. Monitoring of heart rate, blood pressure was continued throughout the surgery and postoperative period.

Any side effects like headache, dizziness, palpitation, tremors and nausea or vomiting were also noted post-operatively.

Statistics

Kolmogorov - Smirnov test was performed to confirm the normal distribution of the data. Numerical data were presented as Mean ± SD. Demographic data like age, height and weight were analyzed by two sample't' test and gender of the patients by Chi-square test. Hemodynamic data of the two groups were compared by ANOVA repeated measures. The categorical data analyzed by Chi-square test and P values of <0.05 was considered as statistically significant. The analysis was performed by NCSS (10) statistical software.[6]

Results

Table 1: Demographic variables

	Group I	Group II	P.VALUE
Age (Mean ± SD)	59.68 ± 9.98	60.80 ± 8.93	0.21
Weight (Mean ± SD)	153.80 ± 8.54	153.65 ± 9.23	0.86
Height (Mean ± SD)	55.28 ± 13.55	57.66 ± 12.64	0.26
Sex (M/F)	107/118	121/104	0.61

***P value ≤ 0.05 is significant**

The demographic data from the patients of two groups are summarised in table 1 and are found to be comparable between the groups.

Table 2 summarises the hemodynamic changes in both the groups during the study period. HR and DBP values were comparable at all the intervals during the study period. SBP and MAP values have shown statistically significant difference at the baseline time and at all the intervals.

Table 2: Heart Rate and Blood Pressure (n= 225) Mean ± SD

Time	Heart Rate			Systolic Blood Pressure			Diastolic Blood Pressure			Mean Blood Pressure		
	Group I	Group II	P value	Group I	Group II	P value	Group I	Group II	P value	Group I	Group II	P value
BS	77.26±13.51	78.62±14.94	0.33	121.51±18.32	128.84±19.93	0.00*	73.25±10.63	75.03±10.07	0.01*	87.54±13.14	91.28±13.21	0.00*
5 MIN	78.94±14.08	77.71±14.59	0.36	123.86±19.07	130.88±19.96	0.00*	75.35±10.72	76.46±09.93	0.26	88.81±13.57	93.71±14.15	0.00*
10 MIN	78.27±14.43	77.11±14.91	0.41	121.39±19.86	128.99±19.61	0.00*	73.84±10.64	75.39±09.92	0.11	87.99±13.56	92.42±13.52	0.00*
15 MIN	77.33±14.13	75.78±14.28	0.23	122.39±18.29	128.28±19.86	0.00*	73.26±10.33	74.82±10.31	0.11	87.36±13.07	90.30±12.84	0.01*
20 MIN	76.79±13.59	75.94±14.84	0.45	121.22±18.49	128.16±19.61	0.00*	73.49±10.42	74.72±10.29	0.21	86.99±13.41	90.73±12.91	0.00*
30 MIN	76.21±13.31	74.85±14.16	0.29	121.76±17.56	127.85±20.11	0.00*	73.14±09.47	74.39±10.16	0.18	86.45±12.62	90.12±13.35	0.00*
1 HOUR	75.82±14.07	74.36±14.57	0.28	124.99±18.80	129.61±19.86	0.00*	74.84±10.53	74.27±10.49	0.83	87.62±13.15	89.99±14.77	0.07
2 HOURS	75.41±14.35	75.84±14.62	0.35	127.81±18.22	134.41±19.55	0.00*	75.28v10.61	75.51±10.85	0.83	88.11±11.84	90.21±12.21	0.02*
3 HOURS	76.26±13.69	76.07±13.81	0.91	128.33±17.73	134.62±19.01	0.00*	76.49±10.44	77.54±10.51	0.31	88.97±12.34	92.21±12.81	0.01*

***P value ≤ 0.05 is significant.**

The mean rise in the heart rate was one beat per minute in group I and a drop of 4 beat per minute in group II from the base values (Fig 1).

SBP increased by 7 mm Hg in group I and 6 mm Hg in group II (Fig. 2).

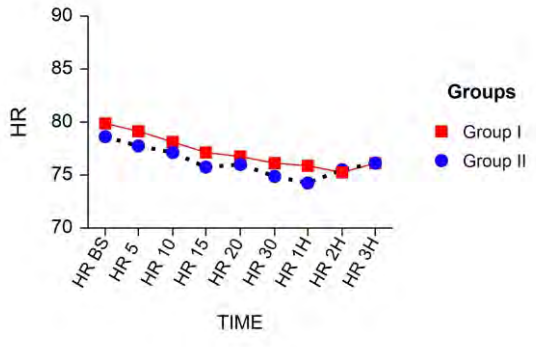

Figure 1 Heart rate per minute observed in the two groups

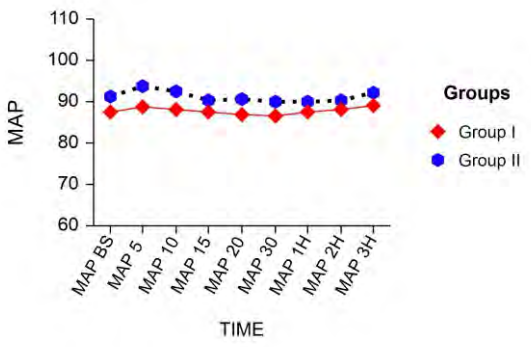

Figure 2 Systolic blood pressure measured in the two groups

The variation in DBP was 3mmHg and 2 mm Hg in group I and group II, respectively from the base values (Fig. 3).

MAP values varied by only 1 mm Hg in both the groups (Fig. 4).

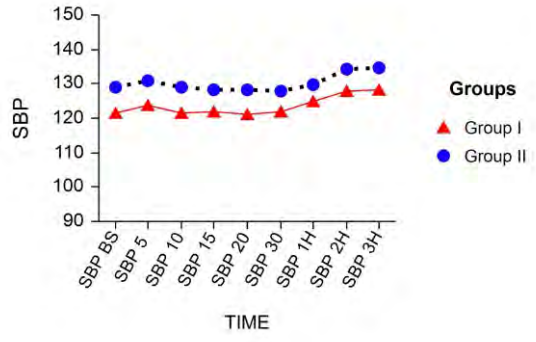

Figure 3 Diastolic blood pressure measured in the two groups

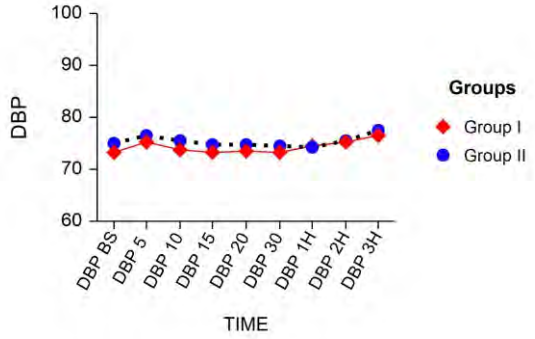

Figure 4 Mean arterial blood pressure measured in the two groups

Table 3 represents the comparisons between the groups at the various time intervals. Between the groups, statistically insignificant change was observed for the mean HR and the mean DBP from the baseline values. Mean SBP and the mean MAP values when compared between the groups was p- 0.000 and p- 0.0012.

Table 3: Heart rate and blood pressure comparison between the two groups (Mean+SD)

	Group I	Group II	P.VALUE
Heart Rate (HR) per minute	77.16±13.69	76.21±14.28	0.45
Systolic Blood Pressure (SBP) mmHg	123.65±18.12	130.18±19.34	0.00*
Diastolic Blood Pressure (DBP) mmHg	74.29±10.63	75.34±10.51	0.221
Mean Blood Pressure (MAP) mmHg	87.75±13.46	91.22±13.52	0.00*

***P value ≤ 0.05 is significant.**

We didn't observe severe hypertension, arrhythmias or ischaemia in any of our patients. No patients from either of the two groups complained of headache, dizziness, palpitation, tremors and nausea or vomiting.

Discussion

Phenylephrine is primarily used as a decongestant, mydriatic, vasopressor and also to relieve hemorrhoids.[5] Unwanted systemic absorption of topical phenylephrine has long been suggested to cause adverse cardiovascular consequences.

This was a prospective randomised study done in 450 normotensive and hypertensive patients, scheduled for ophthalmic surgery with phenylephrine 5% and tropicamide 0.8% for pupillary dilatation.

We did not observe any adverse effects of phenylephrine in the present study. The parameters like HR and DBP showed a statistically insignificant rise from the baseline values. The rise in the mean SBP and MAP showed significant difference statistically from the baseline readings that can be considered clinically insignificant to affect the cardiovascular status. Sander et al. studied the relationship between circadian blood pressure patterns and progression of early carotid atherosclerosis and mentions that systolic blood pressure variation of less than 15 mm Hg as safe and more than that has increased prevalence of coronary artery disease. [6]

Mohammed Ather et al.[2] studied the effect of 5% phenylephrine eye drops on BP in hypertensive patients. They concluded that the rise of SBP was 17.2 mm Hg in hypertensive and 9.2mmHg in normotensive patients. We observed the mean rise of SBP by 7 mm Hg in group I (normotensive) and 6 mm Hg in group II (hypertensive) patients. Similarly pupillary dilatation with 10% phenylephrine eye drops did not significantly increase systemic BP in 87% of normotensive and hypertensive patients.[3] Statistically insignificant rise in the mean SBP was mentioned in patients receiving 10% phenylephrine in different study that is comparable to our study results.[7] In contrast, significant rise in the mean SBP was observed by N B Kenawy et al.[8] with topical 10% phenylephrine. They observed rise in SBP by 34.4 mm Hg and 22.8 mm Hg in normotensive and hypertensive patients respectively. Another study also mentions about an increase in the SBP in both the hypertensive and normotensive patients by 10-40 mmHg. (Samantaray and Thomas).[9]

In our study, the mean rise in DBP was 3mm Hg and 2 mm Hg in group I and group II patients and this was statistically insignificant. McReynolds et al.[10] observed less than 10 mmHg rise in only 6 patients out of total 100 and 94 cases and hypertensive patients had no rise in the BP. DBP was observed to increase by 10-30 mmHg in both the hypertensive and normotensive patients in an old study.[9] Another study by Kenawy et al.[8] concluded that topical 10% phenylephrine increased the DBP by 10.5 mm Hg and 16.8 mm Hg in normotensive and hypertensive patients respectively. But, in a study report by Mohammed Ather et al.,[2] the risk of rise in DBP was 10-20 mm Hg in hypertensive patients and only 4% of normotensive patients with a p value of 0.0028 (topical 5% phenylephrine). In comparison to our study, the above studies showed a slightly higher increase in the DBP.[3,9]

J Skunca et al.[1] compared the cardiovascular effects of 10% and 2.5% topical aqueous phenylephrine and found statistically insignificant difference in the HR and MAP between the hypertensive patients (25) and control patients (24). Similarly, the present study observed statistically insignificant increase in HR between the groups at all the intervals. The HR is expected to increase by 15 beats per minute even in healthy individuals after standing from sitting position. [11] We observed statistically significant increase in the MAP between the hypertensive and normotensive patients, but the increase was less than 10mm Hg so e rise was considered within the clinically limits. This change is considered normal physiological with postural or circadian variations.[12,13] Meta-analysis was done from the related articles to find the cardiovascular adverse effects of topical phenylephrine and they concluded that the change in BP was not clinically relevant with

2.5% phenylephrine and however, with 10% phenylephrine there was a transient rise in the BP that reverted back to normal within 20 minutes.[14]

Fraunfelder et al.[15] had conducted a review study on reported cases of adverse reactions to 10% phenylephrine in 39 cases, in which 15 had myocardial infarction and 11 were fatal. Most adverse reactions occurred approximately 20 minutes after application of the phenylephrine. Case reports mention about the adverse reactions like hypertension and cerebrovascular accidents[16–19] ventricular arrhythmia [20] and sub-arachnoid hemorrhage.[21] Venkatakrishnan[22] and Abdelhalim Ashraf A et al[23] reported (in case reports) about the occurrence of pulmonary edema after topical phenylephrine absorption during pediatric eye surgeries under general anesthesia. A case of cardiac arrest was reported by Samaneah et al.[24] A definite increase in blood pressure was observed with topical phenylephrine in all of their cases as reported by Chin et al.[25] However, in our study of 450 patients (normotensive or hypertensive), none of them complained of any adverse effects and even we didn't observe severe hypertension. The above reports may be because of inadvertently used higher dose when the dilatation is not adequate or when the dilatation is to be achieved faster. This might have resulted in the cumulative effect of the drug.

Systemic absorption of ophthalmic phenylephrine decreases by following the safe measures or strategies.[26]

1. Application of digital pressure on the naso–lacrimal passage immediately for 60s following topical administration of eye drops.
2. The 2.5% topical strengths of phenylephrine is an equipotent mydriatic to 10% phenylephrine so to be preferred.
3. Avoid unnecessary repetition of doses and allow adequate time for the pharmacologic effect to occur,
4. Quick blotting away of excess drops after drug administration and
5. The use of micro drops in infants if possible.
6. Small size drops with increased concentration, improves the therapeutic index of eye drops.

Limitations in our study may be the changes in the haemodynamic parameter that can occur due to the anxiety, discomfort or pain during surgery. This was common in both the groups.

Conclusion

Topical phenylephrine 5% and tropicamide was used for pupillary dilatation in both normotensive and hypertensive patients undergoing cataract surgery. The fixed dose of the drug was used and hemodynamic monitoring was done perioperatively. Statistically insignificant increase in the mean HR and the DBP was observed from the baseline values and between the groups. A slight increase in the SBP and the MAP was observed from the base values in both the groups and between the groups. This increase was clinically negligible and within permissible limits, so it is considered safe clinically. Calculated or fixed doses of topical 5% phenylephrine can be used safely for pupillary dilatation in both hypertensive and normotensive patients undergoing ophthalmic examination/surgery but under guidance and hemodynamic monitoring.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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Case Report

Orbit to jejunum- Story of travel of an ophthalmic instrument

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Abstract

Rhino-orbital-cerebral mucormyocosis, lead to a large necrotic areas in the orbit which in turn can result in exenteration of the orbit. Facial reconstruction is done using orbital prosthesis. Here, we report a case of 55 year old male patient, posted for osseointegrated prosthesis, who had an implant slipping into an unusual and unpredictable site.

Keywords : Mucormycosis, osseointegrated, exenteration.

Introduction

Mucormycosis is a devastating, potentially lethal fungal infection caused by a group of moulds called mucormycetes.[1] Incidence of this infection rose sharply in India during the COVID-19 wave in 2021, leading to a surge of cases of rhino-orbital- cerebral mucormycosis (ROCM).[2,3]

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In case of extensive orbital and Central Nervous System (CNS) involvement including large necrotic areas in the orbit orbital exenteration, the most severe form of orbital debridement is performed. Following the devastating aftermath of SARS-CoV-2 and Mucormycosis infection, a huge burden of patients requiring a facial reconstruction is left behind.

The rehabilitative options for these patients include dispensing an orbital prosthesis. The orbital prosthesis can be mounted on a spectacle frame, or retained with an adhesive or could be an osseo-integrated variety where implants with magnetic properties are placed in the orbit and the silicone prosthesis is fit over it to allow an implant retained prosthesis. While the spectacle mounted prosthesis does not provide with a very satisfying cosmetic outcome, the stick-on prosthesis gives a good outcome, but it has its own limitations as the adhesive does not last for more than 4 hours. The osseointegrated prosthesis provides a good outcome but requires a longer period and multiple surgeries.

The fabrication and dispensing of osseointegrated prosthesis is carried out in three stages.

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Pre operatively, appropriate sites for implant placement over healthy bone are determined based on orbital computed tomography (CT) scans. In stage one of the process, implants are fixed over the orbital rim and covered with cover screws. In step two, the cover screws are replaced with abutment screws and in step 3 customised prosthesis is made and dispensed.[4] Here we will discuss an interesting and unpredicted intra operative complication of osseointegrated implant placement.

Case Report

A 55-year-old male patient came to us with history of right-side rhino orbital mucormycosis post COVID 19 infection in April 2021. He underwent right orbital exenteration along with sinus debridement elsewhere and came to us for opinion for cosmetic rehabilitation. On examination, the right socket was exenterated and there was presence of a sino- orbital fistula which was also connected with the naso and oro-pharynx, Figure 1a, 1b and 1c. CT scan of the patient showed heathy orbital rim with deficient orbital floor posteriorly along with deficient anterior maxillary wall, Figure 1d.

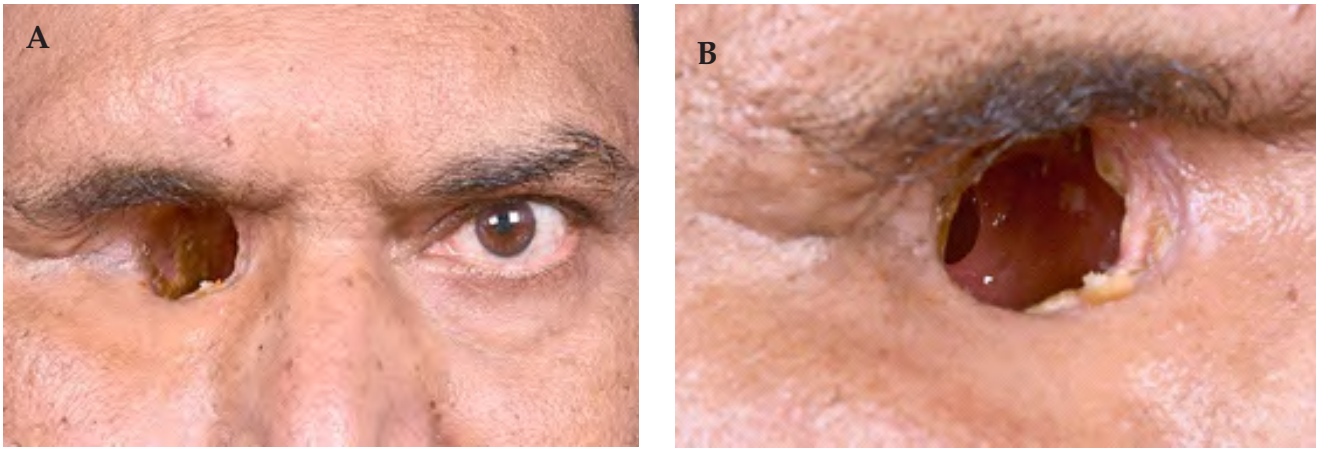

Figure 1a&b Exenterated right socket

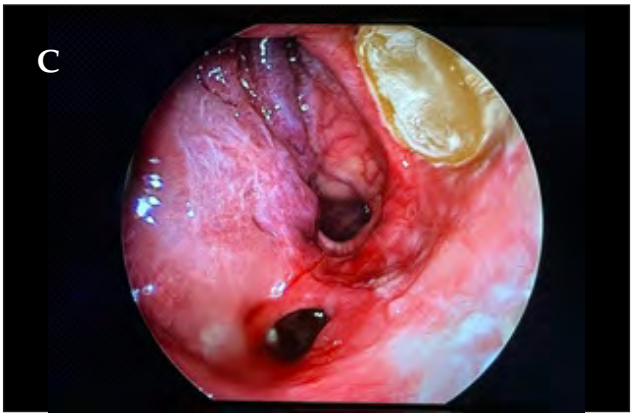

Figure 1 c: Endoscopic view of the orbit showing fistulas

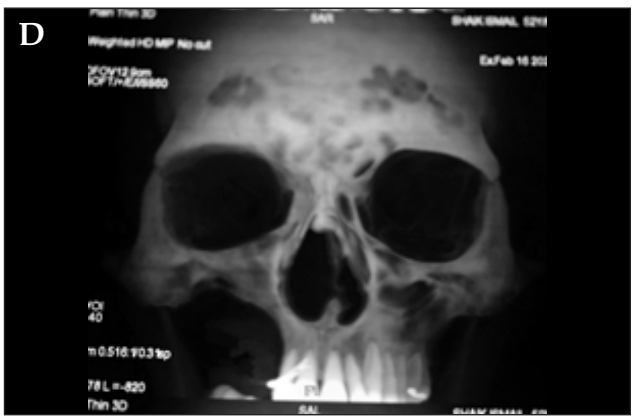

Figure 1d: CT scan orbit connecting to the oro pharynx

Patient was planned for Osseointegrated implant for right eye. During step one, Skin incision was given according to the pre-determined sites and periosteum reflected. Osteotomies were drilled over the orbital rim using a surgical guide and four implants fixed inside the osteotomies as shown in Figure 2a.

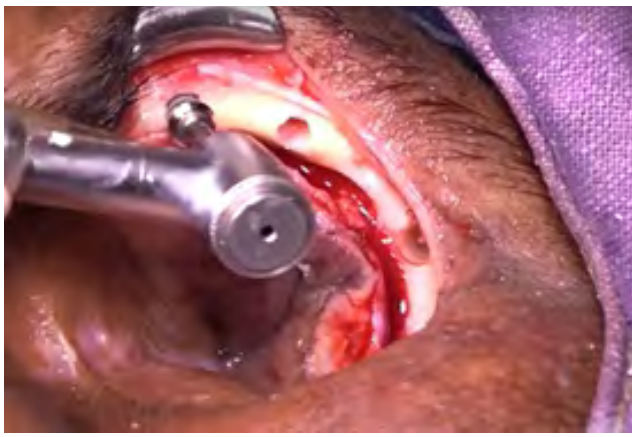

Figure 2a(representational): Step 1- Implant (arrow) being fixed in the osteotomy

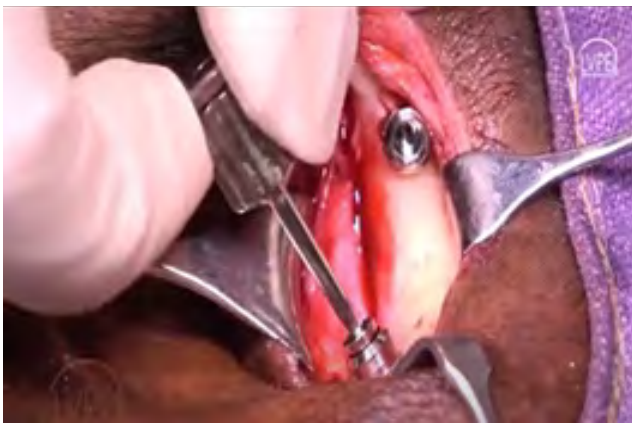

Figure 2b(representational): Step 1- Cover screw(black arrow) being fixed into the implant

Cover screws were then placed over the implant and fixed to avoid growth of soft tissue over it and the skin was closed, Figure 2b. After 2 months, once the osseointegration was complete and the same was confirmed on CT scan, step 2 was planned.

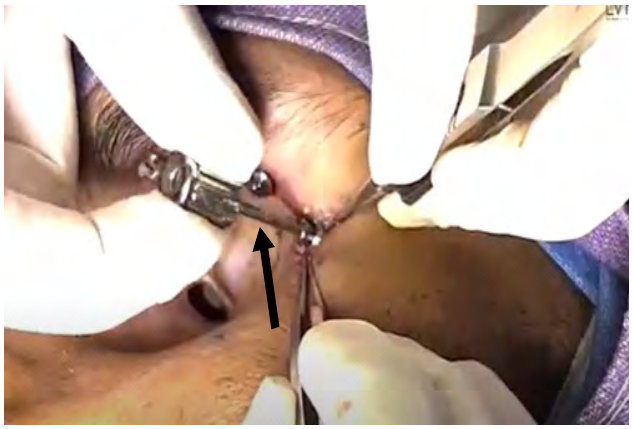

Figure 2c(representational): Step 2- Cover screws being removed with the help of a Hex driver (black arrow)

Step 2 of the surgery was planned under local anaesthesia. During the step 2 surgery, the superior two abutment screws were removed using the Hex driver, Figure 2c. The third abutment screw was tightly fitted and, in an attempt to remove it, the driver slipped from the surgeon's grip and fell into the orbital fistula and disappeared in the pre-exiting sino-orbital fistulous opening within seconds. An attempt was made to locate the driver but in vain. The patient was made to sit and gag reflex was elicited in an attempt to retrieve the driver which again failed. Laryngoscopy was performed by the anaesthetist to rule out passage of the driver into larynx. As the patient had no difficulty in breathing and there was no foreign body seen on laryngoscopy, it was suspected that the patient had swallowed the driver.

A diagnostic X ray was performed and the implant was seen in the lower oesophagus on X ray, Figure 3a. Following opinion of a gastroenterologist, a repeat X ray was performed and it revealed that the driver was in the epigastrium.

Patient was prepared for an upper GI endoscopy. Upper GI endoscopy was performed and the driver was located to be in the jejunum. It was the removed using Rat tooth forceps, Figure 3b and 3c. Patient was doing alright after the procedure and discharged on the same day. Step two of the implant was then completed 2 days later. Prosthesis was prepared for the patient by taking measurements and dispensed.

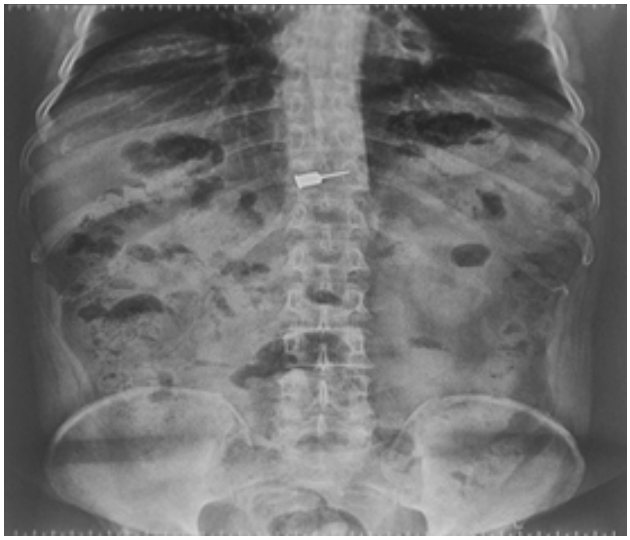

Figure 3a: Showing X ray chest and abdomen showing presence of Driver inside the oesophagus

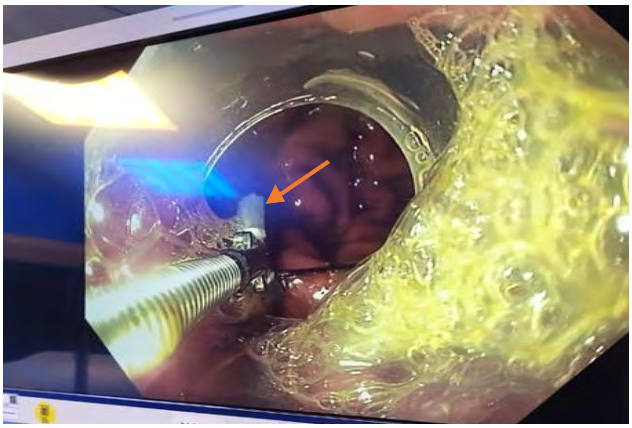

Figure 3b: Endoscopic view: Hex driver being removed using rat tooth forceps

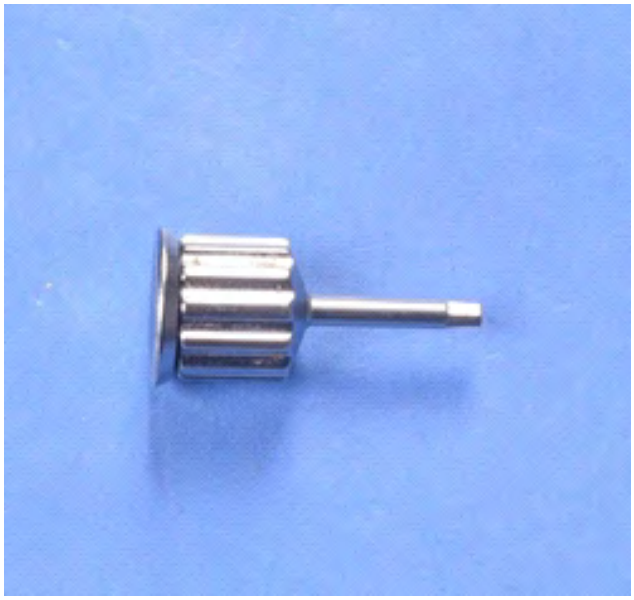

Fig 3c: Showing the Hex driver

Discussion

The known complications of osseointegrated implants include cellulitis, skin reaction or peri-implant soft tissue inflammation, and osteonecrosis.[5]–[8] To the best of our knowledge, this the first reported case of such intra operative complication of osseointegrated prosthesis. The hex driver used to remove cover screws here was of dimensions of- 2.7x0.9 cm with a long pointed tip. It was surprising to note that the patient instantly swallowed an instrument of this size without discomfort.

To avoid such complications in future, it can be suggested that a gauze piece or eyepad be used to cover the orbital fistulas and to handle the instruments carefully.

Conflict of interest:

None

Financial Disclosure:

No financial interest

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Case Report

Anaesthesia Management of a Patient with Saethre-Chotzen Syndrome – A case report

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Abstract

Saethre-Chotzen syndrome (SCS) is a craniosynostosis syndrome characterized by premature fusion of sutures. Patients with SCS have midface hypoplasia, a high-arched palate, obstructive sleep apnea, increased intracranial pressure, congenital heart malformations and ophthalmic disorders. Patients with SCS may be required general anaesthesia due to ophthalmic disorders. These patients may have difficult face mask ventilation, laryngoscopy or intubation. The anaesthesia management of SCS may be similar to other craniosynostosis syndromes. Due to upper limb defects, difficult intravenous cannulation may be a problem. We suggest an appropriate preoperative evaluation, physical examination, and preoperative preparation for difficult airway management and intravenous cannulation. Here, we report an uneventful general anaesthesia management of a child with SCS diagnosed, who underwent strabismus surgery.

Keywords : Craniosynostosis syndrome, Saethre-Chotzen syndrome, Strabismus surgery, Airway management

Introduction

Saethre-Chotzen syndrome (SCS), or acrocephalosyndactyly type III, is a rare craniosynostosis syndrome characterized by premature fusion of sutures with an autosomal dominant inheritance pattern. The prevalence of SCS is between 1:25,000 and 1:50,0001. This syndrome is caused by mutations of the TWIST1 gene. It is characterized by coronal synostosis, brachycephaly, a low frontal hairline, low-set ears, clinodactyly, syndactyly, mild-to-moderate intelligence disabilities, increased intracranial pressure, and congenital heart malformations. Ophthalmic involvement includes hypertelorism, ptosis, strabismus, amblyopia, loss of vision,

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downward-slanting palpebral fissures, epicanthal folds and blepharophimosis. The clinical features which lead to possible airway management problems are midfacial hypoplasia, high arched palate and obstructive sleep apnea (OSA).[1,2] Patients with pediatric syndromes may need medical or surgical treatment for ophthalmic disorders. These patients may require sedation or general anaesthesia to provide ideal conditions for surgery and repeated examination and treatment. Anaesthetic management of SCS can be challenging for anesthesiologists because of these deformities which can lead to difficult airway management and intravenous cannulation as well as intraoperative challenges such as interaction between drugs used for general anaesthesia and ophthalmic drugs, increased intraocular pressure and oculocardiac reflex.[3] There is limited information about the anaesthetic management of SCS in the literature. Here, we report general anaesthesia management of a child with diagnosed SCS for strabismus surgery.

Case report

A 3-year-old, 18 kg male patient was evaluated for elective strabismus surgery. In the preoperative evaluation, the patient was diagnosed with SCS with clinical features of the syndrome such as mental retardation, micrognathia, macrocephaly, strabisumus and with craniofacial abnormality, Mallampati score was III. See Figure 1 His laboratory tests, electrocardiography and echocardiogram were within the normal range.

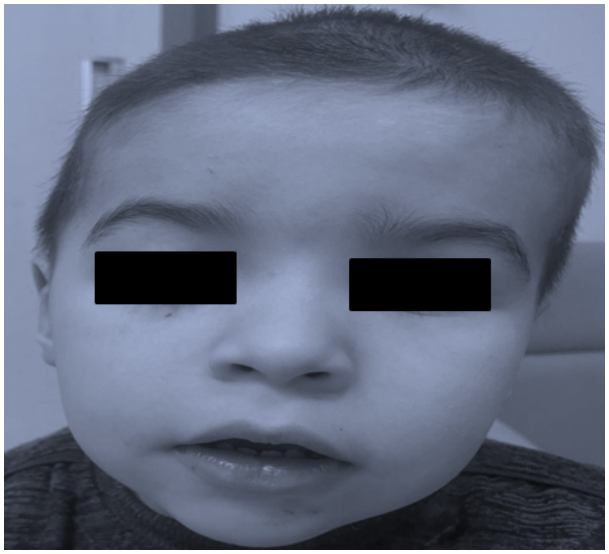

Figure 1. Facial features of the patient with Saethre-Chotzen syndrome

After obtaining written informed consent from his parents, the patient underwent standard anaesthesia monitoring. The patient's initial vital signs in the operating room were as follows: heart rate, noninvasive blood pressure and SpO_2 were 113 beats/min, 84/55 mmHg, and 98%, respectively. All alternative difficult airway devices according to pediatric difficult airway algorithm (oral and nasal airways, different-sized endotracheal tubes, laryngeal mask airway (LMA), video laryngoscope, fiberoptic bronchoscopy) and ultrasonography (USG) were kept available in the operating room due to a possible requirement for difficult airway management and difficult intravenous cannulation. Intravenous cannulation was achieved by an experienced anesthesiologist without USG. Anaesthesia was induced by lidocaine (1 $mg.kg^{-1}$), propofol (3 $mg.kg^{-1}$), and fentanyl (1 $\mu g.kg^{-1}$). Face mask ventilation was proved to be sufficient. The airway was successfully secured with a size 2.0 LMA.

Anaesthesia was maintained with 2% sevoflurane, and 1:1 O_2/N_2O. The operation was completed after 75 minutes without any hemodynamic instability. Regarding the risk of an immediate respiratory depression due to OSA, the patient was extubated in the operating room when fully awake, still with the precautions for a failed postoperative airway management in place. Then he was transferred to postoperative care unit. The patient was followed closely in the postoperative care unit and then transferred to the ward after the observation duration.

Discussion

Patients with special genetic syndromes may have surgery for ophthalmic issues and require attentive anaesthetic management. While patients sometimes have diagnosed syndrome beforehand, genetic syndromes should be highly suspected in the patients with specific clinical features during preoperative evaluation and consultation with a paediatrician or geneticist is required to confirm the accurate diagnosis.

Patients with SCS have many prominent clinical features which may, in turn, affect anaesthetists' care and preferences for the anaesthesia plan. Although there are many reviews about such craniosynostosis syndromes, there is limited literature describing the perioperative management of SCS. The management plan should include a preoperative visit to figure out possible perioperative risk factors and issues to deal with.

Ideally, anaesthesia management of these cases should be safe, practical, and without adverse effects. Appropriate perioperative management will provide a stable hemodynamic, minimal effect on intraocular pressure, and prevent potential procedure-specific adverse events3. Patients with midface hypoplasia, fused cervical vertebrae, cleft palate or proptosis can have difficult face mask ventilation, laryngoscopy or intubation. Due to upper limb defects, difficult intravenous cannulation might be expected in patients with SCS. Intubation and extubation are the most important stages of anaesthesia management that affect the patient's hemodynamics. The use of endotracheal tube may increase intraocular and intracranial pressure more than LMA. It prolongs the anaesthesia duration and recovery time. Extubation and emergence periods may be complicated with OSA.[1,4] Increased intracranial pressure and congenital heart anomalies may be a big problem during intraoperative management because of hemodynamic instability risk.

In our case, we used a LMA to avoid hemodynamic instability and the risk of increase in intracranial and intraocular pressure because LMA was an appropriate airway device for strabismus surgery. Therefore, we had no problem with airway management and hemodynamic stability.[5,6] The anaesthetic agents may affect intraocular and intracranial pressures.[3] We preferred propofol, lidocaine and fentanyl to maintain intraocular and intracranial pressures' stabilities.

In conclusion, when general anaesthesia is required for ophthalmic procedures in pediatric patients with SCS, perioperative evaluation and management of pediatric patients with SCS should be given attention to not only critical clinical features but also nonphysiological conditions such as hypoxia, desaturation or bradycardia which compromise patients' tolerance to anaesthetics' effects. We suggest an attentive preoperative evaluation, physical examination, and preoperative preparation for difficult airway management such as alternative airway devices and difficult intravenous cannulation in patients with SCS. Anaesthetists should know the factors and anaesthetic agents that influence physiological stability of this vulnerable population.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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Case Report

Hypersensitivity reaction following peribulbar block containing hyaluronidase in a patient posted for cataract surgery – A Case Report

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Abstract

Hyaluronidase (HA) is a common additive to local anaesthetic eye blocks because it catalyzes the hydrolysis of hyaluronic acid, a major component of connective tissue. This increases tissue permeability, thereby increasing the dispersion and efficacy of local anaesthetics. Adverse reactions to HA are rare with an incidence of 1 per 2000. Though reactions after peribulbar, retrobulbar and subtenon's blocks are rare and mostly benign, allergy to HA should be included in the differential diagnosis when chemosis, proptosis and restriction of eye movements occur after these blocks.

The reactions can be divided into local and systemic reactions, although both can occur simultaneously. They also can be classified according to the speed of onset of symptoms. Immediate-type hypersensitivity reactions tend to be mediated by immunoglobulin E, whereas delayed-type hypersensitivity reactions tend to be mediated by immunoglobulin G.

We present here a case of hypersensitivity after peribulbar block for small incision cataract surgery. Patient presented with local as well as systemic symptoms in the form of periorbital oedema, angioedema and respiratory depression requiring immediate resuscitation. In such patients who show both local reactions and severe respiratory depression, a fatal outcome is possible if careful rapid treatment is not administered. Therefore, anaesthesiologists should consider the possibility of allergic reactions to hyaluronidase whenever it is added as an adjuvant in ophthalmic blocks. Animal-derived products have been associated with low purity, variable potency, and uncertain safety. Hence use of recombinant human hyaluronidase merits consideration to help improve the safety and quality of these blocks.

Keywords : Hyaluronidase, Hypersensitivity, Peribulbar block, Cataract Surgery.

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Introduction

Hyaluronidase enzyme modifies the permeability of connective tissue through the hydrolysis of hyaluronic acid, a polysaccharide found in the intercellular ground substance of connective tissue, and of certain specialized tissues. It provides rapid penetration of anaesthetic agents by reducing the viscosity of cellular matrix, particularly to difficult locations. It has been used to facilitate the dispersion and/or absorption of fluids or medication for many years.1 Hyaluronidase products approved by the USFDA, has been derived from the bovine, ovine, and recombinant human product.

Hyaluronidase is most frequently used in combination with local anesthetics for ophthalmic surgery (e.g, retrobulbar block, peribulbar block, sub-Tenon's block, and van Lint block). The combination is being used for various reasons which includes smaller increases in intraocular pressure (IOP),2 less distortion of the surgical site, reduced incidence of postoperative strabismus and limiting potential myotoxicity of local anesthetics due to quicker spread. It also reduces the dosage of local anaesthetic agent used in the block. It has also been seen in certain studies that addition of hyaluronidase increases globe and lid akinesia, which may improve the safety of the procedure.

Animal-derived hyaluronidase (bovine or ovine testes) is purified through a series of multiple precipitation, fractionation and filtration steps. The final extract is often contaminated with proteases, immunoglobulin, and other elements, which may potentially cause IgE-mediated hypersensitivity reactions. Hyaluronidase allergy, presenting as both type I and type IV hypersensitivity reactions, has been widely reported by several authors.3 Here we present a case report of a patient who presented with hypersensitivity after peribulbar block posted for small incision cataract surgery.

Case History

Sixty-five year old female patient with no known co-morbidities, was posted for cataract surgery. After application of topical drops, peribulbar block with 2% xylocaine 3ml and 0.5% bupivacaine 2ml with Inj hyaluronidase 15 IU/ml was administered. The intra-operative period was uneventful. In the postoperative ward, bilateral periorbital edema with erythema was noticed which was more on the side of surgery. Patient was not able to vocalize. Immediately oxygen 2-3 litres / minute was supplemented through nasal cannula. Intra venous access was secured and the vitals were checked. (Blood pressure – 160/80 mm of Hg, pulse rate- 82 bpm, SpO2- 96% in room air). Injection Adrenaline 1ml of 1/10000 dilution, Injection Hydrocortisone100mg and Injection Avil (Chlorpheniramine) 2ml were administered intravenously slowly. Around two minutes later, patient became apneic and unconscious.

Her Pulse rate was 90 beats/min, SpO2 was around 90%, and blood sugar level was 80mg/dl. Rescue breaths with Ambu bag was given. Meanwhile 100ml of 25% Dextrose and Injection Dexamethasone 8mg were administered. Around two minutes later, spontaneous breathing attempts resumed and patient started responding to oral commands. On auscultation of chest, normal breath sounds was heard without any added sounds.

Vitals were stable with pulse rate around 70 bpm, blood pressure – 130/70 mm of Hg, SpO2- 98%. The patient was shifted to multispeciality hospital for further evaluation and observation. After around 4 hours, patient's periorbital edema gradually reduced and she was shifted back to our hospital where she was monitored throughout the remaining day. Next day, patient was examined and discharged with oral steroids and antihistamines.

Discussion

Peribulbar block has been commonly used to achieve akinesia and anaesthesia for intraocular surgeries. Hyaluronidase has been frequently used as an adjunct with local anaesthetic agents for better penetration of local anaesthetic agents. Though few cases of reaction due to local anaesthetics like lignocaine or bupivacaine have been reported, the incidence is very low. Reactions due to hyaluronidase have been reported previously.4,5,6,7,9 The incidence of reactions due to hyaluronidase is approximately 1:2000.

Patients have shown acute, early, intermediate and delayed reactions after peribulbar block for ophthalmic surgery. Hypersensitivity reactions have occurred at various doses of hyaluronidase.

Hypersensitivity reactions are divided into four types, based on the mechanisms involved and time taken for the reaction, with the type I hypersensitivity reaction being the earliest to manifest. Immediate reactions depend on the release of mediators of inflammation by tissue mast cells or circulating basophilic leukocytes. These mediators include histamine, leukotrienes, prostaglandins, platelet activating factor, enzymes, and proteoglycans. Drugs can trigger mediator release either directly ("anaphylactoid" reaction) or through IgE-specific antibodies. The symptoms of type I hypersensitivity reaction takes only few minutes to manifest whereas Type IV reaction may take a few hours to days in order to appear.10

In this patient, immediate onset of symptom could represent a Type I hypersensitive reaction (IgE mediated reaction). Patient had received peribulbar block with three drugs (lignocaine, bupivacaine and hyaluronidase). Since the incidence of hypersensitivity to local anaesthetics is rare, the reaction is most probably due to hyaluronidase. Mostly it presents with local symptoms, systemic reactions like pruritis, generalized rash, diffuse bilateral wheeze, anaphylaxis have also been reported. Most commonly axial proptosis,

periorbital erythema and edema, rapid rise in orbital pressure leading to vitreous loss, reaction of extraocular muscles, restriction of extraocular muscles movement, periorbital pain and chemosis have occurred. These can lead to expulsive choroidal hemorrhage, retrobulbar hemorrhage or orbital cellulitis. Delayed onset may simulate pseudotumour. The reaction and proptosis may mimic peribulbar hemorrhage and orbital cellulitis also. Systemic effects may be mild to severe. There has been a case report of patient going into hypotension, tachycardia, hypoxia requiring immediate intubation and ICU care. Allergic reactions have also been reported with retrobulbar7 and, sub-Tenon's blocks.

Kirby et. al4 reported type 1 hypersensitivity with periorbital edema and chemosis in few minutes. Quick hill6 reported delayed reaction, after 36 hours of peribulbar block.

Bowman and Newman conducted a study to investigate whether Hyaluronidase improved the efficacy of peribulbar block.8 It was found that there was no statistically significant difference between the 2 groups receiving peribulbar block with and without Hyaluronidase. Hence addition of Hyaluronidase as an adjuvant in ophthalmic blocks can be avoided if possible; especially in patients with tendency to develop allergic reactions to drugs.

Conclusion

Anaphylaxis to hyaluronidase is a rare complication of peribulbar anesthesia. It can cause both Systemic type I anaphylactic reaction as well as delayed local type IV reactions. They may occur even without prior sensitization as in the above case. In this case, the local reaction in the form of periorbital edema, systemic effects like angioedema and respiratory depression occurred. The reaction required administration of antihistamines, systemic steroids and required CPR to assist respiratory depression. Although rare, the possibility of hyaluronidase allergy should be considered even in patients with no known previous exposure.

Conflict of interest:

None

Financial Disclosure:

No financial interest

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Brief Communication

Paediatric Syndromes with Craniofacial Abnormalities and Ophthalmic Manifestations – Anaesthetic implications

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Paediatric syndromic patients with eye disorders frequently require anaesthetic management for repeated ophthalmic examinations and surgical treatments or both. These patients present a challenge for the anaesthesiologists particularly regarding airway management or systemic stability throughout the procedure.[1] These syndromes with ophthalmic presentations may be categorized in five groups as phacomatoses, connective tissue disorders, chromosomal anomalies, metabolic storage diseases and craniofacial abnormalities. Each group has specific manifestations that may affect procedural anaesthesia practice.

In this issue of the journal, Catalca and et al. highlighted Saethre-Chotzen syndrome with craniofacial abnormalities focusing on its possible challenges for the anaesthesiologists.[2] In these patients, the airway management and vascular access might be predominantly difficult.

Other than Saethre-Chotzen syndrome, there are various conditions under the classification of craniofacial abnormalities. Hypertelorism, telecanthus, craniosynostosis, the first and second brachial arch defects are frequently associated conditions with ocular manifestations which are also very familiar conditions for the anaesthesiologists in name and management. While ***Apert Syndrome, Pfeiffer Syndrome and Crouzon Disease*** are the most common examples of disorders with craniosynostosis, Goldenhar Syndrome and Treacher Collins Syndrome are mandibulofacial dysostoses related to the first and second brachial arch defects. There are several rare disorders with ocular findings under this group.

Apert Syndrome is caused by the synostosis of coronal suture with the phenotypic features such as mid-facial hypoplasia, high arched or cleft palate, lower jaw protrusion

Key Words: Craniofacial Abnormalities, Anaesthetic implications, Difficult airway

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which all may, in turn, complicate safe airway management. These patents have shallow orbits, severe proptosis, globe subluxation, strabismus as esotropia with a V-pattern. They usually present for strabismus surgery and reconstructive procedures. They may present with supraglottic airway obstruction by the rate of 4.5%.[3] However, infraglottic anomalies may also exist. An extensive plan for tracheal intubation should be available since supraglottic airway devices may not fit or work properly.[4] Intraoperative hypoglycaemia and hyponatremia, sometimes persistent, should always be considered in these patients.[5] Other than these precautions, due to abnormal orbit and globe manifestations, the non-operated eye should be conserved highly to avoid any eye injury during the surgery.

Very similar to Apert Syndrome, patients with ***Pfeiffer syndrome*** have extremely shallow orbits and severe proptosis with corneal exposure. They have characteristic broad and short thumbs and toes. Due to respiratory distress because of severe nasal obstruction, these patients may require neonatal tracheostomy and may present to operation room with their permanent canula which should be replaced during the anaesthetic management with an endotracheal tube or another tracheostomy canula which is compatible with the surgery.[6] Laryngeal web may observed.[7] They frequently have obstructive sleep apnea and related postoperative risks. They commonly present for strabismus surgery and the same preparations regarding airway management with more sophisticated equipment such as fiberoptic gadgets and non-operated eye preservation should be in place while these patients undergo an eye operation.[8]

Crouzon Disease, also similar to the previously mentioned syndromes, manifests with severe proptosis, corneal opacity due to exposure and optic nerve compression, iris coloboma, microcornea, ectopia of lentis, maxillary hypoplasia, hook-shaped nose, flattened forehead, respectively large tongue and deafness. Brainstem herniation and Chiari I syndrome may be observed due to small cranial vault. Glaucoma and strabismus are very common in these patients. Securing the airway is expected to be difficult and requires a preparation according to difficult airway algorithm guideline. Obstructive sleep apnea risk should be evaluated preoperatively. Sedatives and opioids should be avoided while postoperative chest physiotherapy and CPAP should be employed.[9] Possible increase in intracranial pressure due to abnormal head shape should not be aggravated by hypoventilation and hypercarbia.[10]

Goldenhar Syndrome (Oculoauriculovertebral-spectrum) shows typical features such as hemifacial microsomia and asymmetry, mandibular hypoplasia, cleft lip and palate, external, middle and internal ear malformations and

hearing disorders, vertebral anomalies such as scoliosis, spina bifida and fusion defects. Brainstem compression, cerebrospinal fluid disruption can be present. Eye involvement include limbal dermoids, epibulbar or conjunctival lipodermoids, lid dermoids. These features are bilateral in Goldenhar Syndrome and may be along with malformations of heart, lung, and kidney.[11] The upper airway manifestations of Goldenhar syndrome range from malocclusion to temporomandibular joint ankylosis making mouth aperture limited.[12] These patients may have difficult airway management, atropine-resistant bradycardia and impaired renal function.

Treacher Collins Syndrome (Mandibulofacial dysostosis) has bilateral ophthalmic manifestations such as eyelid coloboma, absence of lacrimal punctum, lower lid notch, ptosis along with systemic signs that may complicate airway management. These abnormalities include hypoplasia of malar and mandibular bones, cleft palate, blind fistula between mouth and ears. Their upper airway obstruction may worsen by age and direct laryngoscopy becomes more difficult concomitantly.[13] However, there are papers in the literature depicting successful use of supraglottic airway equipments. The level of anomalies at presentation for preoperative evaluation ensures anticipating possible perioperative complications. Therefore, further radiologic imaging and multidisciplinary team involvement should be planned before the surgery in difficult cases.[14]

The other rare disorders with ocular findings include, but not limited to, Aicardi, Cockayne, Rubinstein-Taybi, Hallermann-Streiff and Fetal Alcohol Syndromes.

Aicardi Syndrome presents with strabismus, nystagmus, microphthalmos, optic nerve hypoplasia and ptosis, and skeletal anomalies such as spina bifida, cleft lip and palate, fused ribs and vertebral anomalies. However, it is predominantly significant due to the progressive neurological deterioration such as mental retardation, seizures and hypotonia and death at childhood.[15] Neuromuscular agent effect is to be prolonged. Seizure prevention is recommended. These patients may require anaesthetic management for supportive measures since there is no specific treatment.

Patients with Cockayne Syndrome typically have premature aging and dwarfism. Facial features include bird like appearance and eye disorders such as nystagmus, corneal opacification, cataracts, band keratopathy, poor pupillary response. While neurological sequelae such as mental retardation, cerebellar ataxia and neurosensorial deafness require general anaesthesia or sedation in these patients for every intervention, muscle rigidity and seizures complicate the anaesthesia management.[16] Unfortunately, mortality is expected during late adolescence in Cockayne Syndrome. These patients may have myocardial ischemia and delayed recovery after anesthesia.[17]

Rubinstein-Taybi Syndrome features short stature, mental retardation, broad thumbs and toesantimongoloid slant of palpebral fissures as well as high arched palate and denervation atrophy of the muscle which challenges the anaesthesiologist while securing airway and controlling muscle relaxation.[18,19]

Hallermann-Streiff Syndrome is characterized with midfacial hypoplasia, microcornea, mandibular hypoplasia, beaked nose and dwarfism. Every patient with Hallermann-Streiff Syndrome has congenital cataract and may present at the operation room for cataract extraction. The patients with this syndrome have narrow upper airway associated due to craniofacial configuration.[20] This feature as well as obstructive sleep apnoea complicates anaesthetic management and requires further attention.[21]

Patients with Fetal Alcohol Syndrome are exposed to large amounts of alcohol during the first trimester. They have facial abnormalities, low birth weight, developmental and mental retardation, optic nerve hypoplasia or atrophy.[22] They frequently have a cardiac anomaly such as Fallot tetralogy and early mortality is highly due to cardiac disorders and pulmonary infection. They may require surgery due to strabismus, ptosis and anomalies of anterior segment. Difficult airway management is the main problem of these patients during anaesthetic management.[23]

In conclusion, paediatric syndromic patients with craniofacial abnormalities and ophthalmic manifestations need attentive perioperative care when anesthetic management is employed. The anesthesiologist should suspect a related condition and demand further evaluation to confirm the diagnosis in these patients since particular preoperative preparations are required in each syndrome. However, the risk of difficult airway management is the common issue in every patient with craniofacial anomalies.

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Conflicts of interest

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Brief Communication

Real-time View Mannequin Training System for Practicing Peribulbar Blocks

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Background and Aims

Most of the eye surgeries are done under regional anaesthesia, especially under peribulbar (needle) blocks. Many life and vision threatening complications have been reported to occur following regional anaesthesia. A recent series of adverse events during cataract surgery reported from Massachusetts (USA) included 5 cases of wrong eye blocks, 3 cases of haemodynamic instability, 2 cases of retrobulbar haematoma/haemorrhages, and 5 cases of permanent loss of vision due to globe perforation.[1] The Massachusetts Expert Panel survey reported the presence of a wide variation in anaesthesia practices, and needle-based blocks were used in 47.0% of cases for cataract surgery. They recommend that anaesthesiologists should perform at least 10 blocks.[1]

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However, a training system for regional ophthalmic blocks is rare or limited, and little attention is paid to allow an objective and complete out-of-the operating-room learning experience for administering ophthalmic regional block. Simulations may reduce the potential complications of needle-based blocks, and these are generally simulated on a human skull or its synthetic replica to show anatomical landmarks and to demonstrate needle trajectories. In this regard, our institutions have developed and clinically validated a real-time view mannequin training system for practicing needle-based blocks, Figure 1a.2

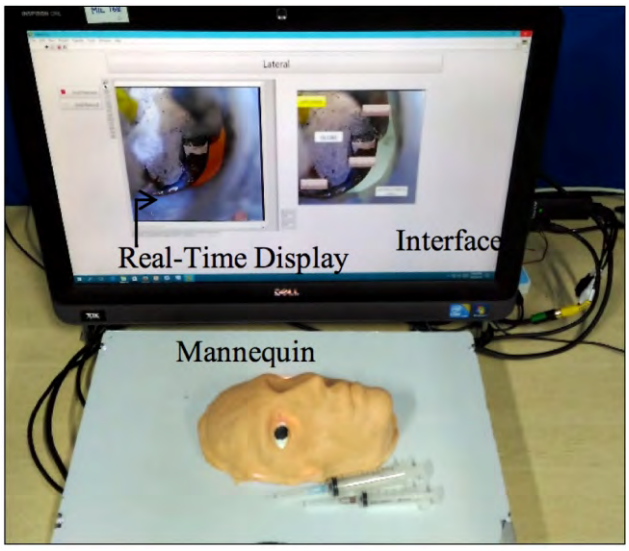

Figure 1a: Developed anaesthesia training system.

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Special Features and its uses

It provides a Human analogue replica of the normal globe, extraocular muscles, optic nerve, intraorbital space and orbital walls which helps the participants to learn more easily about the anatomy.

It provides the ability to visualize the needle track pathway inside the orbit which shows them about the spatial relationship existing between the needle, globe and the orbital walls.

It also has ability to see the angulation and needle length inserted into the orbital space which enables them to know about the degree of angulation and depth of the needle at which the globe, extraocular muscles and optic nerve are encountered.

LED indicators warnings are present for muscle proximity, angulation warning, procedural warning and for needle-globe touch.

It has sensing system of digital ocular massage.

It has innate video screen recorder which helps the participants to review their session and correct their technique accordingly, if they are wrong in approach.

Technical highlights

The Mannequin's facial features are moulded using Oomoo 30 and Dragon Skin 20, a special type of moulding rubber from a modelled anatomically accurate Human face, Figure 1b.

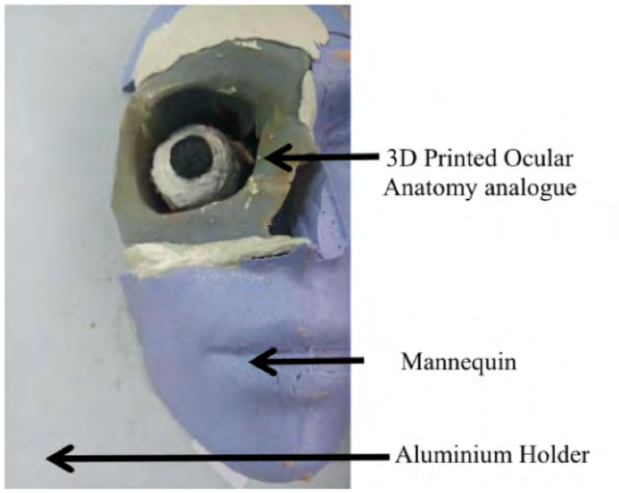

Figure 1b: Anatomically accurate modelled

The Skin is cast using a Silicone rubber. It consists of two layers to mimic the Epidermis and the Subcutaneous layer from Dragon Skin 20 and Ecofflex 0030 by Smooth-OnTM, respectively to represent the texture and feel of the human skin.

The right orbital space is replaced with the 3D modelled Human eye and the orbit.

The 3D design and printed model of globe with the extraocular muscles and orbit mimicking normal globe orbit relations.

There are two analog High Definition (AHD) camera, model number SKU VZGR1394. One is positioned at the infero-lateral position providing the lateral view visualizing the infero-lateral intra-orbital space, Figure 2 and the other one is placed in the medial position providing the view visualizing the supero-medial intra-orbital space, Figure 3. A Mux Switch circuit is used to switch between the two cameras.

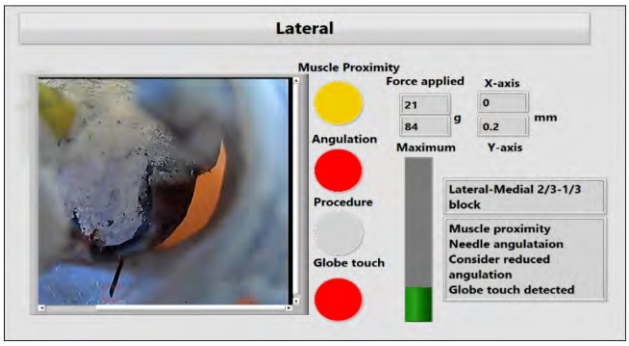

Figure 2: Lateral view with the interface showing warnings for improper angualtion, muscle proximity and globe touch

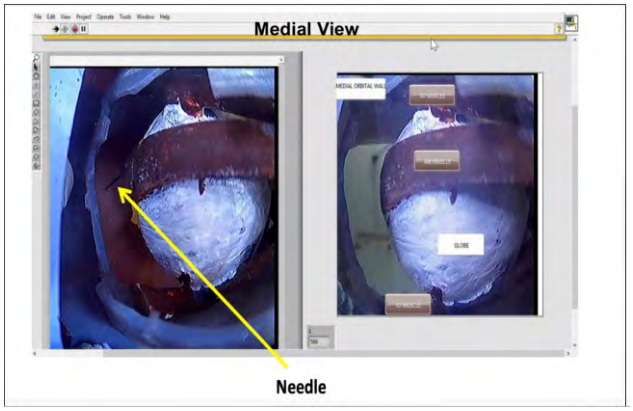

Figure 3: Medial view with the interface showing warnings for improper angualtion, muscle proximity and globe touch

The interface is on NI LabVIEW. The video is displayed using the NI IMAQ Drivers. Switching between the views is done through the interface. A needle position tracking algorithm tracks the position of the needle within the orbit and provides appropriate warnings, Figure 2.

The system uses resistive and magnetic sensors for occular digital massage, the same NI LabVIEW interface is used to show the appropriate warnings, Figure 2.

Limitations

Abnormal globe:orbit conditions like deep set (shrunken) globe, forward set globe, myopic eyes etc were not simulated. However provision are such that these structures can be obtained with simple substitution.

Future scope

In future, integration and simulation of the major vessels inside the orbit like ophthalmic artery and venous plexuses will be done.

Simulation of the abnormal globe:orbit conditions to learn performing eye blocks in these challenging cases will also be done.

Conclusion

This type of training system by providing visual and physical feedback is novel to the ophthalmic anaesthesia training. It can be utilized as a teaching module as well as a practicing tool to perform peribulbar blocks correctly. This in turn can enable ophthalmologists/ anaesthesiologists especially the trainees to administer a safe regional anaesthesia in their patients.

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Conflicts of interest

There are no conflicts of interest.

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