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Comparison of hemodynamic effects of epinephrine (1:200000) infiltration with or without lignocaine in endonasal endoscopic dacryocystorhinostomy

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ABSTRACT

Background

Obtaining adequate hemostasis is of utmost importance during surgery to improve the surgical field.

Aims and Objectives

The objective of this study is to determine the hemodynamic and haemostatic effects of same concentration of epinephrine with or without local anesthetic used during Endonasal Endoscopic Dacryocystorhinostomy (EE-DCR).

Material and Methods

Prospective, randomized study was undertaken on sixty patients selected for endonasal endoscopic dacryocystorhinostomy under general anaesthesia. Group A received 8-10ml of epinephrine 1:200,000 with Lidocaine and Group B received 8-10ml of epinephrine 1:200,000 with normal saline.

Results

In our study we found a statistically significant increase in SBP, DBP, MAP, HR from baseline value in group B with the value reaching a peak at around 5 min and then the parameters start normalizing towards baseline over several minutes. Whereas in case of group A patients, there was no significant changes in baseline values except a mild decrease in all parameters including SBP, DBP, MAP and HR.

Conclusions

The quality of surgical field was comparable in both groups without any significant differences. Addition of lignocaine to the epinephrine attenuates the cardiovascular side effects of epinephrine without affecting the visualization of the surgical field.

Keywords: Endonassal Endoscopic Dacryocystorhinostomy (EE-DCR), Hemodynamic Changes, Epinephrine, Lignocaine

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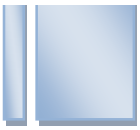
INTRODUCTION

Dacryocystorhinostomy or DCR is among the common oculoplastic surgeries performed for managing epiphora due to nasolacrimal duct obstruction.[1] It is a bypass procedure that creates an anastomosis between the lacrimal sac and the nasal mucosa via a bony ostium. It may be performed through an external skin incision or intranasally with or without endoscopic visualization.[2] The major



limiting factors for endoscopic endonasal approaches area relatively smaller opening between the lacrimal sac and nasal cavity hence its complex anatomy and the high vascularity.[3] Often, a slight haemorrhage is sufficient to dramatically reduce visibility creating a poor surgical field. Thus, obtaining adequate haemostasis is of outmost importance during surgery to improve surgical field and prevent complications. Vasoconstriction is typically achieved by a combination of topical application and local infiltration of anaesthetic containing epinephrine.[4] Topical vasoconstriction can be achieved by local application of epinephrine, oxymetazoline hydrochloride.[5,6] Although epinephrine during endoscopic endonasal surgery provides excellent haemostasis, it can also be coupled with potential adverse effects such as hypertension, hypotension, tachycardia arrhythmias. Furthermore, these adverse effects may cause more serious complications in susceptible.[7, 8] In our presence study we had designed a randomized controlled trail assessing the hemodynamic and haemostatic effects of 1:200000 epinephrine with or without lignocaine during Endonasal Endoscopic Dacryocystorhinostomy (EEDCR).

MATERIAL AND METHODS

After obtaining approval from hospital ethical committee the present study was undertaken in Postgraduate Department of Ophthalmology, Government Medical College, Srinagar. This is a prospective, randomized study undertaken in patients with 11- 45 years of age, with epiphora due to nasolacrimal duct (NLD) obstruction. The criteria for exclusion from the study are: patients younger than 11 years and older than 40 years, Patients with bleeding disorders, coronary artery disease and patients on antihypertensives.

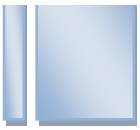
Patients selected for surgery were among those who stand admitted in Ophthalmology ward of the hospital. Pre-anaesthetic evaluation was done at least 24 hours prior to surgery. A history including previous anaesthetic exposure, medication and allergy to any drug was inquired about. General physical examination and systematic examination including cardiovascular system, respiratory system and central nervous system was performed. Airway assessment was also done to predict any difficult intubation. All the investigations viz. CBC, BT, CT, LFT, KFT, CXR and ECG was checked. All the patients were weighed. The patients were advised to remain fasting overnight prior to surgery. On the day of surgery in operating room IV line was secured and RL started. The multichannel monitor was attached to the patient and baseline vitals viz. HR, NIBP, SP02 and ECG were recorded. Monitoring was continued intra-operatively.

Study Groups

This study was conducted in 60 patients who were distributed in two groups by systematic random sampling. Group A received 8-10ml of epinephrine 1:200,000 with lignocaine and Group B received 8-10ml of epinephrine 1:200,000 with normal saline. Each patient was induced with Propofol 1%, 2-2.5mg/kg body weight and muscle relaxation was achieved with Atracurium 0.5mg/kg body weight for endotracheal intubation and surgical procedure. Anaesthesia was maintained with N_2O ± O_2 ± isoflurane 0.6% - 1%, with $EtCO_2$ between 32-42mmHg.

Surgical Procedure

Local infiltration was done using 2% lidocaine with 1:200000 adrenaline or saline with 1:200000 adrenaline and nose packed with the same using cotton pledges. Both infiltration and topical anaesthesia is better than anyone alone. Surgery consisted of basic steps.[9,10] Elevation and simultaneous complete excision of nasal mucoperichondrium flap anteroinferior to middle turbinate (MT) around 5–10 mm as the first step. Exposure of ascending process of maxilla and adjacent lacrimal bone. Removal of bony processes overlying sac and NLD which are usually ascending process of maxilla, lacrimal bone, agger nasii and sometimes also anterosuperior using kerrison 2–3 mm punches up cutting and down cutting. Adequate hemostasis is a must during procedure lest orbital fat can create trouble which lies in close proximity. Removal of bone was accomplished using kerrison punches.



Intraoperatively

Intra-operatively data of the following patient parameters was collected during procedure using Datex-Ohmeda monitor: HR, ECG for arrhythmias, Systolic Blood Pressure, Diastolic Blood Pressure (SBP and DBP respectively), and Mean Arterial Pressure (MAP) measured from Blood Pressure (BP) cuff. These parameters were monitored throughout the procedure and were repeated at 1 minute intervals for first 7 minutes. Two groups of patients were analysed: Group A received 8-10ml of epinephrine 1:200,000 with lignocaine and Group B received 8-10ml of epinephrine 1:200,000 with normal saline. There were no significant differences between the two groups with regard to age, sex, weight, ASA status and baseline SBP, DBP, MAP and HR. HR, SBP, DBP and MAP were recorded at 1 min interval for 7 minutes and the mean values were expressed as mean±SD. Intraoperatively quality of surgical field will be assessed using the following scale of Fromm and Boezaart.

Table 1 Quality of Surgical Field

GRADE	ASSESSMENT
0	Slight bleeding, cadaveric conditions.
1	Slight bleeding, no suctioning required
2	Slight bleeding, occasional suctioning required.
3	Slight bleeding, frequent suctioning required. Bleeding threatens Surgical field a few seconds after suction is removed.
4	Moderate bleeding, frequent suctioning required, bleeding that Threatens surgical field a few seconds after suction is removed.
5	Severe bleeding, constant suctioning required. Bleeding appears faster than can be removed by the suction; surgical field severely threatened, and surgery usually not possible.

RESULTS

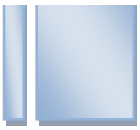
There was no significant difference in the demographic profile of the patients in terms of Age, Weight and Gender as depicted in Table 2. The baseline vitals of the two groups were comparable without any significant differences (Table 3).

Table 2 Demographic Profile of Patients

	Group A (N=30) Mean±SD	Group B (N=30) Mean±SD	P Value
Age	26.3±5.76	25.6±6.32	0.625
Weight	50.4±5.68	51.05±4.43	0.270
Gender (M:F)	18:12	16:14	0.672

Table 3 Baseline Data

Variables	Group A (N=30) Mean±SD	Group B (N=30) Mean±SD	P Value
Baseline SBP	121.5±4.86	120.0±6.58	0.323
Baseline DBP	79.4±3.65	78.5±4.02	0.409
Baseline MAP	93.4±3.20	92.4±3.62	0.240
Baseline HR	75.2±4.23	75.5±3.50	0.811



In our study we found a statistically significant increase in SBP, DBP, MAP and HR from baseline values in Group B with the values reaching a peak at around 5 minutes and then the parameters start normalizing towards baseline over several minutes. Whereas in case of Group A patients, there was no significant change in baseline values except a mild decrease in all parameters including SBP, DBP, MAP and HR. The quality of the surgical field was comparable in both the groups without any significant differences. Group B patients showed a statistically significant increase in SBP from baseline value over time as compared to Group A where there was no significant increase in SBP from baseline value (Table 4). Group B showing statistically significant increase in DBP from baseline as compared to Group A (Table 5).

Table 4 Systolic Blood Pressure (SBP)

Time	Group A (Mean±SD)	Group B (Mean±SD)
BL	121.5±4.86	120.0±6.58
1 Min	122.0±3.45#	126.0±5.75*
2 Min	123.7±3.42#	131.1±4.10*
3 Min	123.1±2.73#	137.77±5.54*
4 Min	122.4±4.42#	142.2±3.12*
5 Min	121.0±3.04#	148.73±3.29*
6 Min	120.4±3.79#	146.47±3.27*
7 Min	121.4±4.55#	142.1±4.23*

* *Statistically significant difference with baseline (P<0.05)*
# *Non-statistically significant difference (P>0.05).*

Table 5 Diastolic Blood Pressure (DBP)

Time	Group A (Mean±SD)	Group B (Mean±SD)
BL	79.4±3.65	78.5±4.02
1 Min	80.3±3.10#	82.73±3.38*
2 Min	81.0±2.19#	84.4±4.25*
3 Min	80.9±3.36#	89.37±3.12*
4 Min	82.2±5.87#	93.03±5.28*
5 Min	80.7±3.97#	96.97±2.93*
6 Min	77.91±4.09#	91.27±2.80*
7 Min	76.91±4.70#	90±3.52*

* *Statistically significant difference with baseline (P<0.05)*
# *Non-statistically significant difference (P>0.05).*

Table 6 Mean Arterial Pressure (MAP)

Time	Group A (Mean±SD)	Group B (Mean±SD)
BL	93.4±3.20	92.4±3.62
1 Min	94.2±2.37#	97.1±3.38*
2 Min	95.3±1.69#	100±3.18*
3 Min	94.3±2.89#	105.4±3.21*
4 Min	95.1±4.15#	109.3±3.78*
5 Min	94.8±2.92#	114.2±2.24*
6 Min	92.1±3.25#	109.7±2.05*
7 Min	92.1±3.40#	107.43±2.62*

* *Statistically significant difference with baseline (P<0.05)*
# *Non-statistically significant difference (P>0.05)*

MAP also showed a significant increase from baseline value in Group B as compared to Group A. There was a significant increase in HR from the baseline in Group B as compared to Group A (Table 7). There was no significant difference in hemostatis and quality of the surgical field in the two groups (Table 8).

Table 7 Heart Rate (HR)

Time	Group A (Mean±SD)	Group B (Mean±SD)
BL	75.2±4.23	75.5±3.50
1 Min	75.6±3.52#	82.8±3.48*
2 Min	73.7±5.14#	88.5±3.91*
3 Min	77.2±4.83#	93.7±2.69*
4 Min	75.6±4.38#	98.2±3.71*
5 Min	75.7±4.00#	108.2±3.38*
6 Min	74.4±3.23#	103.8±3.45*
7 Min	74±5.08#	98±2.59*

* *Statistically significant difference with baseline (P<0.05)*
# *Non-statistically significant difference (P>0.05)*

Table 8 Quality of the Surgical Field (Homeostasis)

Group	Mean±SD	p-value	Significance
Group A	2.03±0.49	0.447	NSSD
Group B	1.93±0.521		

NSSD= Non-statistically significant difference (P>0.05)

DISCUSSION

External as well as Endonasal DCR are commonly performed procedures in the Department of Ophthalmology and both require a good hemostasis to keep visualization of different tissues clear and to decrease blood loss. Hemostasis can be achieved by electric coagulation, compression, controlled hypotension and can also be achieved by vasoconstriction.[11,12] Both topically applied and locally infiltrated vasoconstrictor agents reduces bleeding and improve visualization.[11,12] Adrenaline is a commonly used vasoconstrictor agent, infiltrated locally, reduce bleeding and improve visualization. However, it may lead to significant changes in heart rate and blood pressure. Earlier studies have shown that these changes depend on total dose of adrenaline, speed of absorption of adrenaline into the systemic circulation[13] and vascularity at the site of injection.[13–15]

Lignocaine is generally added to the adrenaline solution to obviate these unfavourable cardiovascular side effects through its action on the myocardium and systemic vasculature. In addition, lignocaine also suppresses the highly nociceptive stimulus caused by the dissection of the subcutaneous tissue because of large amounts of solution used for infiltration. The increase in the baseline values seen in Group B (Adrenaline without Lignocaine) may be explained on the basis of vasoconstriction resulting from the effect of adrenaline on the alpha-1 receptors. Decrease in the baseline values seen in Group A (Adrenaline with lignocaine), is probably as a result of potentiation of β-2 effects of adrenaline by lidocaine. At small plasma concentrations adrenaline exerts a predominant β-2 effect.[16] The myocardial depressant and vasodilatory effects of lignocaine seem to potentiate β-2 effects of adrenaline and cause hypotension. The β-2 effects of adrenaline seem to cause hypotension only in the presence of lignocaine, because a similar decrease in BP was not seen in Group B, which received only adrenaline. Other studies also reported a decrease in baseline parameters when adrenaline is used with lignocaine. Hanuman and Umamaheswara reported more than 20% decrease of MAP in 40 % of the patients compared to the preinfiltration values.[8] Philips and

his colleagues noted significant decrease in mean arterial pressure in 55% of the patients.[17] Yang and his colleagues found decrease in mean arterial pressure in 24% of patients when lignocaine was combined with adrenaline.[18]

SUMMARY AND CONCLUSION

In patients undergoing Endonasal surgeries (EEDCR, FESS, etc.) local infiltration reduces bleeding and improves visualization of the surgical field but at the same time it causes cardiovascular side effects like tachycardia and hypertension, due to systemic absorption of the drug. Addition of lignocaine to the adrenaline attenuates the cardiovascular side effects of adrenaline without affecting the visualization of the surgical field.

REFERENCES

1. Tarbet KJ, Custer PL. External dacryocystorhinostomy. Surgical success, patient satisfaction, and economic cost. Ophthalmology. 1995 Jul;102(7):1065-70.
2. Ali MJ, Naik MN, Honavar SG. External dacryocystorhinostomy: Tips and tricks. Oman J Ophthalmol. 2012 Sep-Dec; 5(3): 191–195.
3. Gauba V. External versus endonasal dacryocystorhinostomy in a specialized lacrimal surgery center. Saudi J Ophthalmol. 2014 Jan; 28(1): 36–39.
4. Bharangar S, Singh N, Lal V Endoscopic Endonasal Dacryocystorhinostomy: Best Surgical Management for DCR. Indian J Otolaryngol Head Neck Surg. 2012 Dec; 64(4): 366–369.
5. Hirshowitz B, Eliachar I. Effective haemostasis with local anaesthesia in nasal surgery. Br J Plast Surg 1972; 25 (3):335-341.
6. Liao BS, Hilsinger RL Jr, Rasgon BM, et al. A preliminary study of cocaine absorption from the nasal mucosa. Laryngoscope 1999; 109 (1):98-102.
7. Horrigan R, Weger EI, Wilson C. Epinephrine-induced arrhythmias during enflurane anaesthesia in man: a nonlinear dose-response relationship and dose dependent protection from lidocaine. Anesth Analg 1978; 57 (5):547-550.
8. Murthy HS, Rao GS. Cardiovascular responses to scalp infiltration with different concentrations of epinephrine with or without lidocaine during craniotomy. Anesth Analg 2001; 92 (6):1516-1519.
9. Peter DJ (2006) Techniques in endonasal Dacryocystorhinostomy. Essentials in opthalmology, Part 3, 71–82, doi: 10.1007/3-540-29969-6-6.
10. Olver JM. The success rates of endonasal Dacryocystorhinostomy. Br Journal of Opthalamol. 2003; 87 (11):1431. doi: 10.1136/bjo.87.11.1431.
11. Dunlevy TM, O'Malley TP, Postma GN. Optimal concentration of epinephrine for vasoconstriction in neck surgery. Laryngoscope 1996; 106:1412-1414.
12. Razavi ME, Noorolllahjan M, EslampoorA Non-endoscopic Mechanical Endonasal DacryocystorhinostomyJ Ophthalmic Vis Res. 2011 Jul; 6(3): 219–224.
13. Cotton BR, Henderson HP, Achola KJ, Smith G. Changes in plasma catecholamine concentrations following infiltration with large volumes of local anaesthetic solution containing adrenaline. Br J Anaesth 1986; 58:59-7.
14. Hayse-Gregson PB, Achola KJ, Smith G. Changes in haemodynamics and plasma catecholamine concentrations after field block for inguinal herniorrhaphy using lignocaine with adrenaline. Anaesthesia 1990; 45:7-10.
15. Sakurai M. Effects of epinephrine in local dental anaesthetics on plasma catecholamine concentration and circulation. Dent Jpn (Tokyo) 1990; 27: 135-9.
16. Goodman A, Gilman A, Rall TW. The pharmacological basis of therapeutics. 8 ed London: Pergamon Press; 1990. p. 192-3.
17. Phillips S, Hutchinson SE, Bayly P, Hollway TE. Adrenaline induced hypotension in neurosurgery. Br J Anaesth. 1993; 70:687–8.
18. Yang JJ, Wang QP, Wang TY, Sun J, Wang ZY, Zuo D, et al. Marked hypotension induced by adrenaline contained in local anesthetic. Laryngoscope. 2005; 115:348–52.