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Prediction of severity of intraoperative haemorrhage during external dacryocystorhinostomy upon body- type (physique) rating - a pioneering study

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Abstract

Background and Objectives: One of the most common complications of external dacryocystorhinostomy (DCR) is haemorrhage. Intraoperative haemorrhage not only hinders the procedures but also delays the operation and unfavourably affects the outcome. In spite of best efforts bleeding do occur. However while some patients bleed heavily during operation, some patients remain exceedingly dry. The objective of this study is to find out whether body-type (endo/meso/ecto-morph) has any co-relation with the severity of intraoperative haemorrhage in dacryocystorhinostomy operation.

Design: Prospective Study.

Methods: Twenty two consecutive patients who underwent DCR by single surgeon(PR) in preceeding two years were included in this study. Each patient's height and weight were recorded and ectomorphy rating was calculated by the formula given by Heath and Carter. Intraoperative haemorrhage was measured in each case by recording the amount of blood collected in the suction container.

Results: Of twenty two patients, fourteen (63.63%) were female and eight (36.36%) were male, with a mean age of 33.04 years (age range: 17–48 years). 9 (Nine) patients were operated on right eye and 13 (Thirteen) were on left eye. The duration for surgery ranged from 30 to 115 min, with a mean of 72.72 min. The amount of intraoperative bleeding ranged between 3 and 18ml (9.09+/- 4.95 ml). In five patients (22.72%), there was severe intraoperative bleeding ($\geq$15 mL). The ectomorphy rating of twenty two patients ranged from 0.1 to 7.23 (2.26+/-1.75) and the Height/Weight$^{1/3}$ ranged from 37.50 to 48.93 (42.04+/-2.62). Patients with ectomorphy ratings were divided into two groups, namely ectomorphy rating $\leq$1.5 (EcR $\leq$1.5) and ectomorphy rating > 1.5 (EcR > 1.5), and intraoperative bleeding was categorised under "Severe"($\geq$15 ml) and "Mild & Moderate" (< 15 ml). Severe ($\geq$15 ml) intraoperative bleeding was found in 22.72% in (EcR $\leq$1.5) versus 0% in (EcR > 1.5) group (P < 0.0500).

Conclusion: Preoperative ectomorphy rating of patient's physique, obtainable from a simple height/weight ratio is a predictor of severity of intra-operative haemorrhage in DCR operation.

Keywords: Dacryocystorhinostomy, Ectomorphy rating, Heath-Carter Somatotype, Intraoperative Haemorrhage

Introduction

The present status of external conventional dacryocystorhinostomy (DCR) is somewhat similar to that of cataract extraction of the era of intracapsular surgery. Some disgruntled cataract surgeons took up the task "to do cataract extraction in a better way" fifty years back and eventually the present day methods of cataract surgery like intraocular lens, phacoemulsification, femtosecond laser surgery etc have evolved over the years. For being cheap and requiring less expertise, external conventional DCR is the procedure of choice for NLD block till today. However it is being done in the same manner it was done 100 years ago. It can be said that not many surgeons are satisfied with the way it is now being done. Nasty intraoperative bleeding and small operating field are the most worrying concern. In fact many ophthalmic surgeons avoid DCR operation for fear of heavy intraoperative bleeding. However no effort to reduce the intraoperative bleeding has yet been successful. Another common experience among DCR surgeons is that whereas some patients bleed heavily during operation, some patients remain exceedingly dry. However there is no endeavor till date to find out why there is difference of severity of bleeding among patients during DCR operation. Therefore to do DCR operation in a better way, it is felt necessary to first understand the patho- anatomy of intraoperative haemorrhage. Towards achieving this end, it is probably needed to look beyond conventional thinking like careful patient preparation and appropriate surgical technic, controlling infection and hypertension, stopping aspirin like drug intake, ruling out blood dyscrasias etc.[1,2] which are however nowadays routinely taken care of in standardised DCR operations. Therefore in this article the authors have adopted a novel approach and analysed whether body types (endo/meso/ectomorph) have anything to do with the severity of intraoperative haemorrhage. Anthropometrically 'endomorphy means relative fatness, mesomorphy means musculoskeletal robustness and ectomorphy means relative linearity or slenderness of a physique'.[3] Embryologically speaking these physiques represent relative preponderance of tissues derived from entoderm, mesoderm and ectoderm respectively. Therefore a hypothesis is hereby put forward that blood vessels being developed from mesoderm are more abundant in mesomorphs and therefore mesomorphs tend to bleed more in DCR operation. Moreover muscles, bones and nasal mucous

membrane i.e. the sources of bleeding in DCR,[4,5] all are derived from mesoderm. Curiously enough, lacrimal sac which is entirely ectodermal in origin has not been figured as potential source of haemorrhage in any of the studies.[4,5] Therefore the biological plausibility of the co-relation of intraoperative bleeding with body types is thus derived.

Intraoperative bleeding: Despite the best efforts bleeding do occur during the DCR operation. It obscures the operative field and hampers further procedure, and prolongs the operative time (Walland & Rose 1994).[6]

Somatotyping[3] is the technique to appraise body types and applicable to both genders of all ages. Somatotype is expressed in a three number rating system representing endomorphy, mesomorphy and ectomorphy components respectively, always in the same order. For example, a 3-5-2 rating is recorded in this manner and read as three, five, two. These numbers give the magnitude of each of the three components. As per Carter and Heath, 1990,[7] rating of each component of 1/2 to $2^{1/2}$, are considered low, 3 to 5 are moderate, $5^{1/2}$ to 7 are high. A total of ten measurements are required for somatotyping. These are: Height, Weight, skin fold thicknesses at four specific sites on right side of the body, breadths of right humerus and right femur, Upper right arm girth, right calf girth. Somatotyping has extensive application in Sports, however applications in Medicine is also available in literature.[8,9,10]

Ectomorphy rating, the simplest and clinically feasible of the three ratings, based on measurement of Height and Weight only, was adopted for the study. From ectomorphy rating, the spectrum of endomorphy and mesomorphy rating can be derived to the extent needed for the study, because: "….somatotypes high in endomorphy and/or mesomorphy cannot also be high in ectomorphy. Conversely, those high in ectomorphy cannot be high in endomorphy and/or mesomorphy; and those low in endomorphy and mesomorphy must be high in ectomorphy.[3] Therefore those with very low ectomorphy must be high in mesomorphy and / or endomorphy.[10] This principle was utilized in fashioning the statistical analysis.

Methods

Twenty-two consecutive patients who underwent DCR operation by the author (PR) for chronic Nasolacrimal duct (NLD) block following chronic dacryocystitis were studied prospectively. Symptoms of epiphora and regurgitation of purulent /mucopurulent fluid on pressure over the sac was the selection criteria for the operations. Syringing was done in all cases to determine the site of block. Cases with lower canalicular obstruction were excluded**.** Routine preoperative investigations of haemoglobin percent, bleeding time, clotting time, fasting blood sugar and blood pressure were done in all cases. Clearance was obtained from other specialties when needed. ENT clearances were obtained in all the cases. Routine preopertive medications for seven days prior to surgery was as follows: Ciprofloxacin tablet one tablet twice a day, Cetrizine 10 mg. tablet once a day, Xylometazoline nasal drop- two drops in each nostril four times a day, Moxifloxacin eye drop- four times a day. All cases were immunised with injection Tetanus Toxoid. Informed consent was taken.

Preoperatively Height and Weight of the patients were measured as per methods described by Heath and Carter[3] as follows:

Height: Height was taken with the subject standing straight, against the upright wall of the ward, touching the wall with heels, buttocks and back. Head was oriented in the Frankfort plane (the upper border of the ear opening and the lower border of the eye socket on a horizontal line), and the heels together. The patients were instructed to stretch upward and to take and hold a full breath. A wooden scale held at right angles against the wall, above the level of patient's head was now lowered until it firmly touched the vertex. This level of the vertex against the wall was taken as the height of the patient.

Weight: The patients, wearing minimal clothing, stood in the center of the scale platform. Weight was recorded to the nearest tenth of a kilogram. A correction is made for clothing so that nude weight is used in subsequent calculations.

Operative Technique: Standard operative technic of external DCR as described in Sydney Fox's Ophthalmic Plastic Surgery (third edition)[11] book was followed.

Intraoperative time was noted from initial skin incision to final skin suture.

Postoperative management: Preoperative medications were continued for a week in the postoperative period. Skin sutures were removed after seven days. Patients were routinely seen at 1 week, 1 month, 3 months and 6 months postoperatively. Surgery was considered successful when the patient had no epiphora and the fluid passed freely into the nasopharynx on lacrimal irrigation.

Grading of intraoperatve bleeding: The amount of blood collected in the suction container were recorded. A bleeding greater than or equal to 15 ml was defined as 'severe bleeding'. All bleedings less than 15 ml was clubbed into one group as "Mild & Moderate" Bleeding.

Results

Of 22 consecutive patients who underwent external conventional DCR, fourteen (63.63%) were female and eight (36.36%) were male, with a mean age of 33.04 years (age range: 17–48 years). 9 (Nine) patients were operated on right eye and 13 (Thirteen) were on left eye.

The operative duration for surgery ranged from 30 to 115 min, with a mean of 72.72 min. The amount of

intraoperative bleeding was between 3 and 18ml (9.09+/- 4.95 ml). In five patients (22.72%), there was severe intraoperative bleeding (≥ 15 mL).

One patient (4.54%) required nasal tamponade for early postoperative bleeding. No patient developed postoperative wound infection. Twenty one (95.45%) patients were discharged on the next day after surgery. The patient who had postoperative nasal bleeding was discharged after two days of hospitalization.

All patients were followed up for atleast three months. Operation was successful in 20 of 22 (90.90%) patients. In two patients in whom the outcome was unsuccessful, one had a severe intraoperative bleeding and early postoperative anastomosis block and the other had late postoperative anastomosis blockage.

The ectomorphy rating of 22 patients ranged from 0.1 to 7.23 (2.26+/-1.75) and the Height/Weight$^{1/3}$ ranged from 37.50 to 48.93 (42.04+/-2.62).

For statistical analysis of correlation between ectomorphy rating and intraoperative bleeding, patients with ectomorphy ratings were divided into two groups, namely ectomorphy rating ≤1.5 (EcR ≤1.5) and ectomorphy rating > 1.5 (EcR> 1.5), and intraoperative bleeding was categorised under "Severe" (≥ 15 ml) and "Mild & Moderate" (< 15 ml). Fisher's Exact Test was applied for statistical analysis. The difference of severe intraoperative bleeding between EcR ≤ 1.5 and EcR >1.5 was statistically significant(P< 0.0500).

Table 1: Age, Gender and Laterality Distribution

Age and Gender Distribution

		Severe Bleeding		**"Mild & Moderate" Bleeding**		***P* value**
		n	**%**	***n***	**%**	
Age (years)	<30	1	4.54 %	5	22.72 %	0.0701(NS)
	30–39	2	9.09 %	11	50.00%	
	40–49	2	9.09 %	1	4.54 %	
	Mean ± SD	38.20±7.75		31.52 ± 6.62		
Gender	Male	1	4.54 %	7	31.81%	0.0737(NS)
	Female	4	18.18%	10	45.45%	

Laterality distribution

		Severe Bleeding		**"Mild & Moderate" Bleeding**		***P* value**
Laterality	Right	2	40.0%	7	41.17%	1.0000(NS)
	Left	3	60.0%	10	58.82%	

Table 2: Ectomorphy rating and amount of intraoperative bleeding in DCR

Patient's Serial No.	**Height/Weight$^{1/3}$ (cm/kg$^{1/3}$)**	**Ectomorphy Rating***	**Bleeding (ml.)**
1	163 / $37^{1/3}$= 48.93	7.23	6
2	156 / $40^{1/3}$ = 45.62	4.18	3
3	151.5 / $36^{1/3}$ = 45.89	5.01	9
4	147.5/ $40^{1/3}$ = 43.14	2.99	6
5	147.5/$50^{1/3}$ = 40.04	0.91	3
6	149 / 52 $^{1/3}$ = 39.92	0.85	4
7	148.2 / 47 $^{1/3}$=41.07	1.48	18
8	160.5 / $52.5^{1/3}$ =42.88	2.80	7
9	152 /$51.5^{1/3}$ = 40.86	1.32	6
10	153.6/ $50^{1/3}$ = 41.70	1.94	7
11	167.4/$69^{1/3}$=40.92	1.37	16
12	152/$54^{1/3}$ = 40.22	0.99	8
13	142/$36^{1/3}$ =43.06	2.94	4
14	157.5/$57^{1/3}$=41.55	1.83	12
15	150.3/$67^{1/3}$=37.50	0.1	9
16	170.3/$54^{1/3}$=45.77	4.93	6
17	158/$50.5^{1/3}$=43.34	3.12	12
18	166.5/$69^{1/3}$= 41.17	1.55	13
19	154/$56^{1/3}$=40.30	1.03	16

20	$154/61^{1/3}$=39.17	0.50	15
21	$157/53.5^{1/3}$=40.85	1.32	3
22	$151/50^{1/3}$= 41.04	1.46	17
	Mean +/- SD:	Mean +/- SD:	Mean +/- SD (ml)
	42.04+/-2.62	2.26+/-1.75	9.09 +/- 4.95
*If HWR ≥ 40.75, then Ectomorphy = 0.732 HWR - 28.58			
If HWR < 40.75 and > 38.25, then Ectomorphy = 0.463 HWR - 17.63			
If HWR ≤ 38.25, then Ectomorphy = 0.1			

Table 3: Correlation between ectomorphy rating and intraoperative bleeding in DCR

Ectomorphy rating (EcR)	Severe bleeding (≥15 ml) (n)	"Mild & Moderate" bleeding (< 15 ml) (n)	Fisher's exact test P-value
≤1.5	5	6	0.0351 (P< 0.0500) (statistically significant)
> 1.5	0	11	

Discussion

Frequency distribution of age and sex in the present study were in total agreement with previous studies (Walland & Rose,[6] Nerad,[12] Duke- Elder[13]) so also the distribution of laterality of operated eye (R.M.J. Hall[14]). The distribution of age, sex and laterality between the two comparing groups was compatible (Table 1).

One of the most common and serious complications of external DCR is haemorrhage.[15] Intraoperative bleeding not only hinders the procedures but also delays the operation and unfavourably affects the outcome (Walland & Rose 1994).[6] The amount of haemorrhage during external DCR has been reported in various studies to range between 1 and 25 ml (Caesar & McNab 2004,[1] Meyer 2000,[16] Sweet & Hofmann 1983[17]). In the present study, this amount varied between 3 and 18 ml (9.09+/- 4.95 ml). The source of haemorrhage in DCR operation in order of frequency was: 1. Nasal Mucosa 76.1%, 2. angular vein 13.6%, 3. Bones 6%, 4. Muscles 4.3% (Gupta & Gupta 2015).[4] Though we did not categorise bleeding according to source of bleeding, haemorrhages in most of the cases in our series came from nasal mucosa. However source of haemorrhage in no case came from angular vein in our series for strictly adherence to incision-site at 3 mm from medial canthus. It was a striking feature that in all the series i.e. that of Gupta et al,[4] Qadir M et al[5] and of ours, lacrimal sac was notable exception as a source of haemorrhage. Probable explanation is that the lacrimal sac being developmentally ectodermal in origin in entireity, does not have as abundant blood vessels as in other mesoderm derived tissues. This finding goes along our hypothesis that mesomorphs having abundance of blood vessels tend to bleed more.

Gupta & Gupta 2015[4] reported severe bleeding in 8% patients in their series. However we found 22.72% had severe bleeding. This difference was probably due to sample size and parameter adopted for grading severe bleeding.

We have already mentioned that, to the best of our knowledge, this is the first study of correlating physique with severity of intraoperative bleeding. Therefore similar article for comparison with our results are not available. However some studies correlating somatotyping with disease proneness is worth mentioning. Rao and Kanade 2007[8] reported somatic disproportion as a predictor of hypertension in adolescent girls in India. Significant higher values of endomorphy was found in men and women with type 2 diabetes (Buffa et al, 2007).[9] In our study the mean Height/$Weight^{1/3}$ and mean ectomorphy rating were 42.04 and 2.26 respectively. From Heath & Carter table on "Distribution of somatotypes according to the HWR(Height/$Weight^{1/3}$)"[3] it is evident that the somatotypes conforming to these values correspond towards endo-meso spectrum of somatochart. This finding is in conformity with the study of Koleva et al[10] (2002). In their series the most common somatotype was endomorphic mesomorph for men and mesomorph-endomorph for women. Further, in our study, low ectomorphy rating of ≤ 1.5 (EcR ≤ 1.5) was statistical significantly associated with severe intra-operative haemorrhage when compared with ectomorphy rating of > 1.5 (EcR > 1.5) (P <0.0500) (Table 3), whereas Koleva et al[10] found correlation between very low ectomorphy rating with arterial hypertension and liver disease.

Conclusion

Preoperative ectomorphy rating of patient's physique, obtainable from a simple height/weight ratio is a predictor of severity of intra-operative haemorrhage in DCR operation.

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