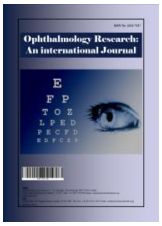

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Factors Associated and Management of Functional Failure after External Dacryocystorhinostomy at Zonal Tertiary Hospital

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Authors' contributions

This work was carried out in collaboration among all authors. Author DM designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author EM participated during the design and analysis of the study. Author WM participated during analysis and helped in the production of this final manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Aims: To determine factors associated and management of functional failure after Dacryocystorhinostomy among patients attending the eye department at KCMC hospital Moshi Kilimanjaro, from January 2007 to July 2018.
Study Design: A retrospective cross-section hospital-based study.
Place and Duration of Study: Conducted at Eye Department Kilimanjaro Christian Medical Centre Hospital, between August 2018 and August 2019.
Methodology: We recruited 184 patients who underwent external DCR surgery from January 2007 to July 2018. The analysis was done using STATA version 14. Chi-square was used to establish the difference in proportions across groups, multivariable logistic regression models were used to determine the associated factors for functional failure. The 95% confidence intervals were constructed; associations were considered to be statistically significant when a P-value was less than 0.05.

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Results: Out of 184 external DCR done, 37 (20.1%) had functional failure, 174 (94.6%) attained anatomical success while147 (79.9%) attained functional success. Fifty-one (27.4%) of cases had a primary function failure, of this 50% was managed by probing and irrigation. Functional failure was associated with postoperative complications (AOR=10.58 (95% CI: 2.24 - 49.88).
Conclusion: Functional failure after external Dacryocystorhinostomy was 20.1%, the anatomical success of external DCR was 94.6% and functional success was 79.9% in our study. The strongest associated factors for functional failure were a post-operative complication and increased age. Therefore, careful post-operative follow-up after DCR procedure should be emphasized to lacrimal surgeons. On the other hand, external DCR remains the surgical management options with good success.

Keywords: External Dacryocystorhinostomy; function success; function failure; anatomical success.

1. INTRODUCTION

Functional failure after Dacryocystorhinostomy (DCR) results when patients persist to have symptoms of epiphora or discharge even though there is a patent Nasolacrimal duct (NLD) by irrigation test. DCR is a surgical procedure that involves the formation of a shunt for drainage of tears between the lacrimal sac and the nasal cavity, bypassing the NLD [1,2]. Dacryocystorhinostomy is a standard surgical intervention meant to treat blocked nasolacrimal ducts of nearly all causes. Presently there are two types of DCR, External and endoscopic [3]. Endoscopic DCR has increasingly become more popular but some surgeons still prefer the external approach over endonasal because it offers higher functional success, provides a wide surgical field, it is cheap and it needs no delicate instruments.

Worldwide, External DCR, it has been publicized to be more than 90% anatomical successful as treatment, in both developed and underdeveloped countries. In Africa, the anatomical success ranges between 63% and 97%. Tanzania's anatomical success of DCR was reported to be 91%. But functional success is regularly reported to be less than anatomical success, lying within the range of 74–83%. A number of patients complain of continual tearing or discharge following DCR, yet although lacrimal system drainage is patent with are no problems with the eyelid or the ocular surface. This discrepancy between anatomical and symptomatic success after DCR is referred to as 'functional failure' [4,5-7].

Around 5% to 15% of patients who underwent external DCR continue to experience a continual tearing or discharge following an anatomically successful external DCR [8]. Functional failure after external DCR if it is not managed properly, causes bother to the patients by continuous epiphora or discharge, later if not treated well can result in fatal endophthalmitis and one can lose the eye and reduce the quality of life [9].

Functional success should be emphasized while analyzing DCR's success. An associated factor for functional failure remains largely undetermined in our setting [3]. Presently there has been little information with regard to the management of functionally failed DCR; some had suggested that canalicular lacrimal silicone intubation is an efficient method for patients with, tearing or discharge following anatomically patent DCR [10].

By knowing the factors associated with functional failure may help clinicians with respect to evidence-based management procedures of external DCR, further follow and counseling of patients.

2. MATERIALS AND METHODS

2.1 Study Design

After we obtained, an ethical clearance certificate number 2342 from Kilimanjaro Christian Medical University College. We did a retrospective cross-section hospital-based study, reviewed the clinical charts of Patients who underwent external Dacryocystorhinostomy surgery.

2.2 Study Setting

This study was carried out at the Eye Department KCMC Hospital. The Eye Department KCMC is the key referral site for ophthalmic cases from Northeastern Tanzania and is the tertiary eye healthcare center for Kilimanjaro, Arusha, Tanga and Manyara administrative Regions of Tanzania. Besides eye healthcare service delivery, the Eye Department is also a training center for Ophthalmologists,

Assistant Medical Officers Ophthalmology, Ophthalmic Nurses, Optometrists, and Medical Students. Every year more than 30,000 patients seek eye healthcare services at the department. There is an average of 15 to 20 external Dacryocystorhinostomy done per year. The eye department has more than 9 Eye specialists assisted by residents and registrars.

2.3 Study Subject

The study involved all patients who underwent external DCR surgery, attending the eye department at KCMC Hospital during the study period.

2.3.1 Inclusion criteria

We included all patients who underwent external Dacryocystorhinostomy surgery at the eye department in KCMC Hospital during the study period.

2.3.2 Exclusion criteria

We excluded patients whose medical files have incomplete information and lost to follow up.

2.3.3 Sampling technique

This was a purposive sampling technique, all eligible patients, consecutively who underwent external Dacryocystorhinostomy surgery at Eye department from January 1st, 2007 to July 31st, 2018 were studied.

2.4 Measurements

2.4.1 Dependent variable

Functional failure (which is defined as the continuation of epiphora or discharge after external DCR even though there is a patent nasolacrimal duct by the syringing test) was determined to base on anatomical and functional success after external DCR surgery. This was measured 12 months after external DCR for those none intubated and six months after silicone tube removal for those intubated. The silicone tube was removed six months after the external DCR. This is a binary variable categorized as having failed and not having a failure. A person was referred to have functional failure if symptoms after external Dacryocystorhinostomy persisted after silicone tube removal.

2.4.2 Independent variables

Both demographic and clinical characteristics were used as independent variables. Demographic variables included age, sex, occupation, region of residence, and ethnic group. While clinical variables included the duration of symptoms, laterality, ocular diseases, ocular surgery, systemic diseases, the indication of DCR, Silicon tube insertion, intraoperative complication, postoperative medication, postoperative complication, and primary failure management.

2.5 Data Analysis

Data were analyzed using STATA version 14 (STATA -Corp, College Station, TX, USA). Data from the data collection forms were entered into the Excel worksheet and later imported into STATA for analysis purposes. Checking on the nature of variables, coding manner, and missing values were observed.

Data were cleaned, coded, and categorized and analyzed using STATA. Categorical variables were summarized using frequency and percentages while continuous variables were summarized using mean and median. The difference in proportions was determined by using the Chi-square tests. Bar graphs and pie charts were used to represent the distribution of anatomic and functional success and management of functional failure pictorially. Overall, results were presented using tables.

Odds ratios were used to show the association between the dependent and independent variables. Crude and adjusted estimates were used to estimate the association between each dependent variable and functional failure. A multivariable logistic regression model was used to determine the factors for functional failure among patients who underwent external DCR. Model selection was performed using the Akaike Information Criterion, 95% confidence intervals were constructed and the association was deemed to be significant when the p-values were less than 0.05.

3. RESULTS

3.1 Demographic and Clinical Characteristics of Study Participant's

Between January 2007 and July 2018, a number of 259 patient's files who underwent an external

DCR was retrieved from the medical record and assessed for eligibility criterion. However, 75 patient' files were excluded from the study because did not meet the inclusion criteria. Therefore, 184 patients (71%) were included in the study. The mean age of participants at diagnosis was 32 ± 28 years; females were 55.98% (Table 1a). Fifty-three (53 26%) patients had a duration of symptoms prior to the primary presentation of below one year. (Fig. 1) About half of external DCR done was at the right eye 51.09% and the indication 82.61% was due to chronic Dacryocystitis. Silicone tube was inserted for about 70.63% of all DCR cases done, and there were a few intraoperative complications of about 2.17% of all cases done (Table 1b).

3.2 Proportions of Secondary Functional Failure Status across Participant Characteristics

Among 37 patients who had a secondary functional failure, 25.24% were females, 35% was aged above 60 years and 7.14% had Post-operative complication and 66.67% external DCR revision (Table 2).

3.3 Treatment Outcome of External Dacryocystorhinostomy

A total of 184 external DCRs were performed during the study period. Functional failure after external DCR is 20.1% and Anatomical success was achieved 94.6% cases and functional success in 79.9% cases (Fig. 1).

3.4 Management of Primary Functional Failure after Dacryocystorhinostomy

Among 184 cases that were undergone external DCR, 51 cases (27.7%) showed a primary functional failure. Of these 51 cases, 10 cases were managed by massaging, 17 cases managed by probing and irrigation, and 6 cases were managed by external DCR revision. Only 14/51 cases (27.4%) got function success. Of these 14 cases, five cases (35.7%) cases managed by massaging seven cases (50%) by probing and irrigation and two cases (14.28%) managed by external DCR revision (Fig. 2).

3.5 Factors Associated with Functional Failure after External Dacryocystorhinostomy

In adjusted analysis, being a female had more than two times higher odds of functional failure (AOR =1.77, 95% CI 0.66.46–4.77), and those aged 60 years and above had higher odds of having functional failure (AOR =1.01, 95% CI = 0.28–3.66). Patients who had postoperative complications had ten times higher odds of getting functional failure (AOR=10.58 (95% CI: 2.247 - 49.888) (Table 3).

Table 1a. Demographic characteristics of participants (N=184)

Variable	Frequency	Percent
Mean age (SD)	32±28	
Age group (Years)		
0-18	82	44.57
19-45	39	21.2
46-60	23	12.5
60 and above	40	21.74
Sex		
Male	81	44.02
Female	103	55.98
Region of Residence		
Kilimanjaro	93	50.4
Arusha	38	20.65
Manyara	14	7.61
Others	39	21.2
Ethnic group		
Chagga	82	44.57
Maasai	8	4.35
Pare	10	5.43
Sukuma	9	4.89
Others	75	40.76

Table 1b. Clinical characteristics of participants (N=184)

Characteristics	Frequency	Percent (%)
Laterality		
Left eye	90	48.91
Right eye	94	51.09
Trauma		
Yes	23	12.5
No	161	87.5
Ocular surgery		
Yes	11	5.97
No	173	94.02
Ocular disease		
Glaucoma	5	2.72
Anterior segment disorder	36	19.57
None	143	77.72
Systemic diseases		
None	161	87.5
DM/HTN	8	4.35
HTN	15	8.15
DCR indication		
Congenital obstruction	24	13.04
Acute Dacryocystitis	7	3.8
Chronic Dacryocystitis	153	82.61
Silicone tube insertion		
Yes	130	70.65
No	54	29.35
Intra op complication		
No	180	97.83
Yes	4	2.17
Post-op antibiotics		
No	9	4.89
IV	13	7.07
Topical and Oral	163	88.04
Post-op complication		
No	170	92.39
Fistula	5	2.72
Infected wound	5	2.72
Nasal bleeding	3	1.63
Tube displacement	1	0.54
Management of primary functional failure (N=51)		
None	18	35.29
Massaging	10	19.6
Probing/irrigation	17	33.33
DCR revision with tubes	6	11.76

4. DISCUSSION

Function failure after external DCR is one of the commonest complaints of patients, on assessment; the majority of these patients had a patent nasolacrimal duct system after irrigation. External DCR is the commonest surgical procedure in patients with NLDO attending eye department. The purpose of our study was to evaluate the functional outcome of external DCR, management options of function failure, and the factors associated with function failure in patients who underwent external DCR.

In this study 44% of patients had at the age category 0-18 years, 55.98% were females, 47.28% were children. Moreover, 53.26% of the patients presented with the duration of symptoms

Table 2. Distributions proportions of secondary functional failure status after external DCR across participant characteristics (N = 37)

Characteristics	N	%	Chi (P-value)
Sex			
Male	11	13.58	3.8389 (0.05)
Female	26	25.24	
Age group			
0-18	11	13.41	10.6246 (0.014)
19-45	5	12.82	
46-60	7	30.43	
60 and above	14	35	
Duration of symptoms			
Below one year	22	22.45	2.9909 (0.393)
Two years	9	25	
Three years	1	9.09	
Four years and above	5	12.82	
Trauma			
No	30	18.63	1.7446 (0.187)
Yes	7	30.43	
Ocular disease			
Glaucoma	2	40	3.1633 (0.206)
Ocular surface disorder	10	27.78	
None	25	17.48	
Systemic diseases			
None	29	18.01	5.2913 (0.071)
DM/HTN	4	50	
HTN	4	26.67	
DCR indication			
Congenital obstruction	5	16.67	0.2643 (0.607)
Chronic Dacryocystitis	32	20.78	
Silicone tube insertion			
No	9	16.67	0.5637 (0.453)
Yes	28	21.54	
Intra op complication			
No	35	19.44	2.274 (0.132)
Yes	2	50	
Post-op complication			
No	29	17.06	12.936 (<0.001)
Yes	8	57.14	
DCR revision with tubes			
No	33	18.54	8.3686 (0.004)
Yes	4	66.67	

for less than 1 year. Most of DCR done (82.61%) were due to chronic dacryocystitis. Overall 20.1% of all external DCR had function failure, 94.6% had anatomic success, and 79.9% functional success. Among those who got functional failure 25.5%, were females, 35% were 60 years and above. Those who had postoperative complications including infected wound and sinus fistula, 57.14% got function failure. Half (50%) of the patient who got function was managed by probing and irrigation. Moreover, the duration of symptoms and the presence of postoperative complications were the major factors associated with the function failure after external DCR.

In our study, we found that the mean age of all patients was 32 ± 28 years and this is different from a study done in India which had the mean age of 58.6 ± 14 years [4]. This suggests that NLD at our population occurs at a young age. In this current study, the mean age of the female is 41.8 years, while the male is 19.71 years. The mean age of males is different compared to females; the number of male children is 52 out of

81 males (64.2%) while the number of female children is 30 out of 103 females (29%). This can be suggesting that male children had prone to trauma than females [8,11].

This study has shown that there is a quite high proportion of external DCR's done on children between the ages of 0-18 years (44.5%) this is similar to a study done here at KCMC but this had a small sample size [12]. But slightly high as compared to a study done from Nepal which establishes that only 17.2% of external DCR cases done were on patients under 20 years of age [13], a study from Iran found this figure to be only 12% and study from Ethiopian patients found that only 10% of operated cases were under the age of 14 [14-18].

In this study, we found that after external DCR the anatomical success is 94.6% higher than that reported in previous studies (~90%) and function success 79.9% which was similar to the study done in Korea which shows 98.8% and 81.9% respectively [3]. The success of external DCR in the literature has been described to lie between 80% and 99%. [16,18-22] equaling the success

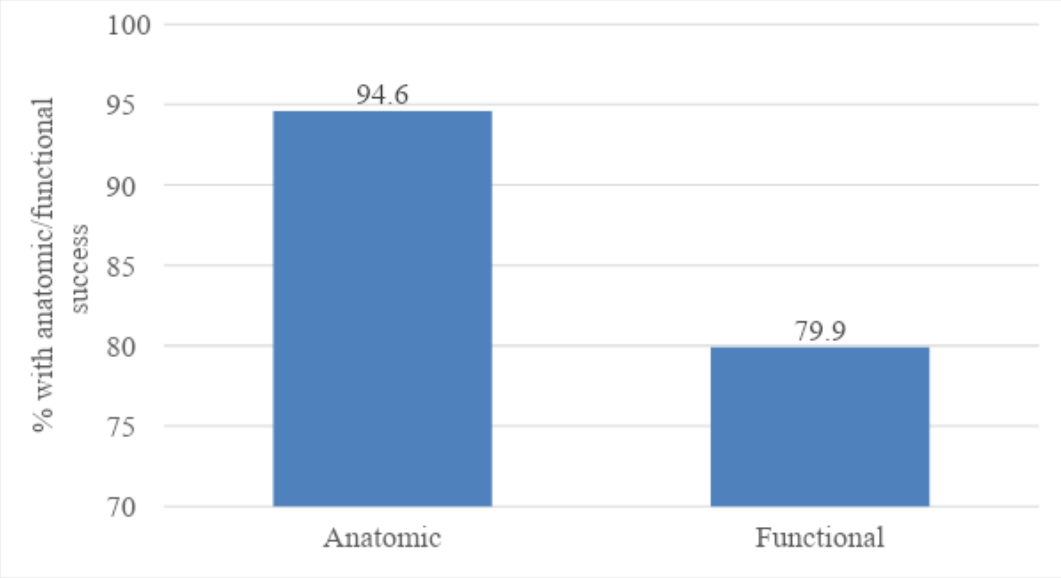

Fig. 1. The distribution of DCR outcome

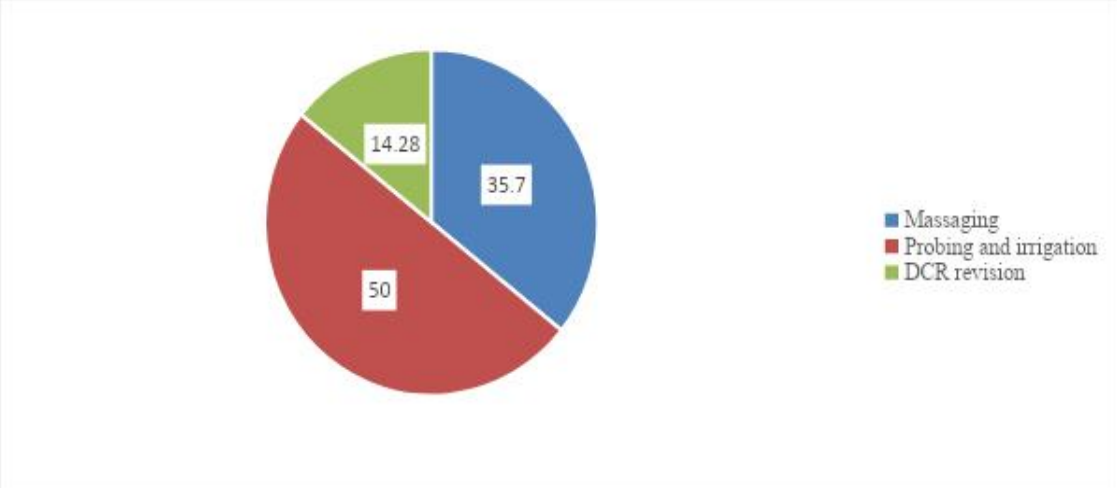

Fig. 2. Percentage distribution of management of primary functional failure

Table 3. Determinants of functional failure after DCR multivariable logistic regression model

Characteristics	Crude estimates		Adjusted estimates	
	COR (95% CI)	P-value	AOR (95% CI)	P-value
Sex				
Male	1	1		1
Female	2.14 (0.989-4.667)	0.053	1.77 (0.662-4.779)	0.253
Age group				
0 – 18	1	1		1
19 – 45	0.94 (0.305-2.948)	0.928	0.51 (0.130-2.061)	0.351
46 – 60	2.82 (0.947-8.414)	0.062	1.06 (0.284-3.997)	0.923
60 and above	3.47 (1.401-8.621)	0.007	1.01 (0.283-3.669)	0.977
Duration of symptoms				
One year and below	1	1	1	1
Two year	1.15 (0.472-2.807)	0.756	1.4 (0.464-4.245)	0.548
Three years	0.34 (0.041-2.848)	0.323	0.43 (0.041-4.474)	0.482
Four years and above	0.50 (0.177-1.454)	0.207	0.28 (0.076-1.081)	0.065
Post OP Complication				
No	1	1	1	1
Yes	6.48 (2.091-20.097)	0.001	10.58 (2.24-49.88)	0.003
Primary failure management				
None	1	1	1	1
Probing/irrigation	8.76 (3.019-25.45)	<0.001	8.56 (2.363-31.035)	0.001
Massaging	6.13 (1.64-22.947)	0.007		0.096

of external DCR surgery could be a difficult task since numerous studies use totally different success standards [23]. Proof of anatomic patency to irrigation doesn't give any information regarding the physiologic function [3,24]. During this study, only patients, who became completely asymptomatic following DCR, with a minimum follow-up time of one year after surgery, were rated as functional successes. Furthermore, a significant aspect required to be taken into consideration is the difference between populations (Racers) [25,26].

In our study, we found that 37 cases (27%) showed primary functional failure. Of these, 10 cases were managed by massaging, 17 cases managed by probing and irrigation, and 6 cases were managed by revision of external DCR. After these managements, the function failure improved from 27% to 20.1% this is different from other studies which reported that the main management of primary functional failure after external DCR is intubation with silicone stent, Lower eyelid tightening, corticosteroid nasal spray, insertion of Lester-Jones tube, Revision DCR and intubation [1,27].

There are few studies that have considered the associated factors of functional failure after external DCR. Most studies investigated basic clinical parameters and anatomical parameters findings [8,5,28]. In this study, we found that no difference between patients who are aged 60 years and above compared to those who are below 18 years. (AOR= 1.01 (95% CI = 0.283-3.669) [27]. In our study also we found that females had a high odds of developing function failure than males (AOR= 1.77 (95% CI=0.662-4.779). This is equivalent to the study done by MJ Lee et al. which shows females had odds of1.982 (0.867–4.527) even though this was not statistically significant [3]. Moreover for those patients who developed postoperative complications had 11 times higher odds (AOR=10.58 (95% CI: 2.247 - 49.888) of getting functional failure than those who had no complications. This is different from studies done in which reported that the main factors associated with functional failure are small lacrimal sac [1,5,6]. So, the more prospective study is needed at our setting.

5. STUDY LIMITATION

The limitations of our study include the design nature of our study which is retrospective, plus some of the information was missing in the patients' medical files, we did not evaluate intraoperative factors which can be affecting the function failure after DCR. Moreover, data on some variables as well as difficultness in retrieving patients' medical files were among

limitations throughout the whole period of data collection.

6. CONCLUSION

In conclusion, in this study, function failure was 20.1% the anatomical success was 94.6%, functional success was 79.9%. The strongest risk factor for functional failure was a post-operative complication, increased age, and being a female. Therefore, careful post-operative follow-up after DCR procedure should be emphasized to lacrimal surgeons. On the other hand, external DCR had a very good post-operative success.

CONSENT

Written and informed concert as per international standards has been obtained from the appropriate authority.

ETHICAL APPROVAL

Ethical approval number 2342 was obtained from Kilimanjaro Christian Medical University College research ethical committee.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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