Surgical Outcome of Intubation Dacryocystorhinostomy with Double Threaded Silk Sutures in Failed DCR

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ABSTRACT

BACKGROUND

We wanted to evaluate the surgical outcome and long-term efficacy of intubation DCR with double threaded 1 - 0 silk in failed dacryocystorhinostomy. The efficacy of 1 - 0 silk suture used as stent material in revision DCR surgery has been scientifically scrutinized.

METHODS

This prospective, observational clinical study was done over a period of two years. A total of 40 patients with unilateral NLD block due to failed DCR was selected. Single anterior flap or no flap DCR surgery was performed with the insertion of double threaded silk sutures by means of stent in all the cases. In the postoperative period, this loop of thread was rotated clockwise and anticlockwise for two months. Syringing was done every week in the 1st month and twice in a week for next one month. Patients were followed up for next one year.

RESULTS

Out of 40 patients, 16 were male and 24 were female. Age of patients ranged from 18 to 55 years. Causes of failures included endoscopic DCR 7 (17.5 %), external DCR 30 (75 %), and primary silicon intubation DCR 3 (7.5 %). Newly made bone ostium's' diameters ranges from 14 mm to 16 mm. Single anterior flaps were performed in 26 (65 %) cases and no flaps in 14 (35 %) cases. Out of 40 cases, Epiphora and discharge from the puncta resolved in 34 cases. Success rate was 85 %. In all cases, double threaded 1 - 0 silk was introduced for active stent. Symptomatic post-operative epiphora was present at the end of one year in 6 (15 %) patients.

CONCLUSIONS

Intubation dacryocystorhinostomy with double threaded 1 - 0 silk suture in failed DCR is surgically functional and anatomically effective in developing countries. This surgical procedure is easy to perform with anyone in rural and urban setup. It is easily accessible and acceptable to everybody. Moreover, 1 - 0 silk suture is readily available. It is a very cost-effective procedure.

KEYWORDS

Intubation, Silk Suture, Silicon Tube, Proline Suture

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BACKGROUND

Epiphora is a common problem in our society. Middle - aged females in low to middle socioeconomic status are the most common victims. The various previously documented causes of failure of Dacryocystorhinostomy are soft granulation tissue, thick membranes and, obscuration of bone ostium. Syringing of failed DCR cases is very helpful. Immediate regurgitation of fluid from the upper puncta without any latency indicated distal common canalicular block or fibrosed sac due to chronic dacryocystitis. Regurgitation of flakes with mucous from the opposite puncta indicated failed DCR with chronic dacryocystitis.[1-8] Probing is also quite informative in failed DCR cases. Preoperative probing confirms the nature and the level of the block. In cases of distal CC block there may be soft stop. But in cases of failed DCR there may be hard to soft stop. Moreover, the length of the probe is measured from the punctum how much it introduced into the inflow channel or lower canaliculus.[9-15]

Fistula is an abnormal tract between the two hollow organs. Initially the fistula tract is lined by columnar epithelium. Due to constant irritation ether by infection or any rough surface materials, this lining gets changed to squamous epithelium. Silk is rough and generate constant irritation by clockwise and anticlockwise movement. Smooth surface materials like proline and silicon tube never generate constant irritation.[16-22]

Conventional DCR surgery whether double flap or single flap do not address the concern for post-operative anastomotic blockade in case of failed DCR. Failed DCR cases can be best treated by intubation of the anastomotic stoma with Double threaded 1 - 0 silk sutures. The suture material act as a stent to convert the created bypass pathway to a permanent fistula. This permanent fistula tract between the nasal cavity and the lacrimal sac ensures the long term patency of the iatrogenically created bypass tract of tear drainage.[23-27] Intubation Dacryocystorhinostomy procedure involves conventional external DCR followed by insertion of stent in the form of double threaded 1 - 0 Silk suture through the lower canaliculi across the anastomotic ostium into the nose in the form of a circular loop. Previous literatures show that various materials have been used as a stent like Silicon tube, nylon thread and Prolene. In this study both single flap DCR and no flap DCR surgery was performed in all cases followed by 1 - 0 silk suture introduction as a stent material.[28,29]

METHODS

This prospective, observational clinical study was done over a period of two years. 40 patients who met the inclusion criteria were included in the study. Patients who had previously failed DCR with syringing showing regurgitation from same or opposite puncta and who gave valid written consent were included in the study. Failed DCR cases which had atrophic rhinitis**,** bleeding diathesis, traumatic fracture of nasal bones, bony abnormalities of nasal bones, Paget's disease of nasal bones, malignancy, granulomatous disease of nasolacrimal sac, gross deviated nasal septum and hypertrophic turbinates were excluded from the study.

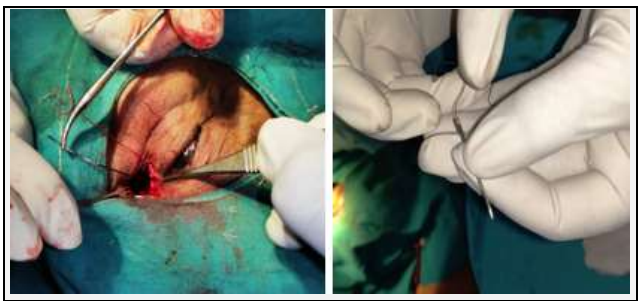


Figure 1. Probe Entangled with 1-0 Silk Sutures Passed through the Common Canaliculus, Opened Out of DCR Wound

Figure 2. Double Threaded 1-0 Silk Sutures Passed through the Common Canaliculus and Opened Out of DCR Wound

Figure 3. Display of External Loop of Double Threaded 1-0 Silk, Which is Rotated Clockwise and Anticlockwise, Kept for Two Months

Figure 4. Double Threaded Silk Suture Passed through Puncta and NLD System. Post-Operative Syringing Shows Free Flow Pathway

Preoperative syringing was carried out before an operation to confirm the diagnosis and to establish the level of the block. In all the cases, syringing was done from the lower canaliculus. In this study all the cases had regurgitation of the flake with mucus from the opposite or

Age	Sex	Pre-Op Syringing Regurgitation	CC Opening Blocked	Per-Operative Bone Ostium Diameter in mm	Bone Ostium Made at Medial Wall of The Orbit	Flap Anastomosis	Post Op Epiphora	Post Op Syringing	Compli--cation
10-20 (n) 10	M-16	Inf. Puncta (n) 12	Membrane (n) 15	Obscured (n) 1- 5	>12 mm (n) 20	Single flap (n) 26	1st wk. (n) 20	1 wk. (n) 10 Partial block -10	Wound infection (n) 10
20-30 (n)31	F-24	Sup. Puncta (n) 23	Granulation Tissue (n) 20	5-10 mm (n)28	>14 mm (n) 12	No flap (n) 14	2nd wk. (n) 16	2 wk. (n) partial block - 8	Nasal bleeding n (10)
30-55 (n)9		Both Puncta (n) 5	Fibrous tissue (n) 5		>16 mm (n) 8		3rd wk. (n) 10	3rd wk. partial block-(n)	Discharge from lachrymal sac (n) 4
							4th wk. (n) 6	4th wk. partial block (N) 6	Ugly scar - 2
							2 months (n) 6	2nd months block -6 (n)	Complete blockage - 6
							One year (n) 6	One-year block-6 (n)	Secondary suture - 2

Table 1. Distribution by Age, Sex Preoperative Syringing, Blockage of Common Canaliculus

Inf puncta = Inferior Puncta, Sup. Puncta = Superior puncta, Membrane Block = Thick Membrane Block, Gra tissue = Granulation Tissue, Fibr. Tissue = Fibrous Tissue Block, Part. Blk = Partial Block

same or both puncta. In this study there was hard to stop in all the cases and probe measured 7 – 10 mm and average of 8.5 mm.

Surgical Procedure

A curvilinear incision 10 – 12 mm in length and 3 mm from the medial canthus was made. The skin was undermined to expose the orbicularis. The muscle was then split down to the periosteum. The medial canthal ligament was cut at its insertion site giving exposure to the sac area. The periosteum was then cut in a same line and undermined laterally with the periosteal elevator and the sac area was exposed. A probe was passed though inferior puncta to tent the sac. In case of distal common canalicular block the probe was not visible.

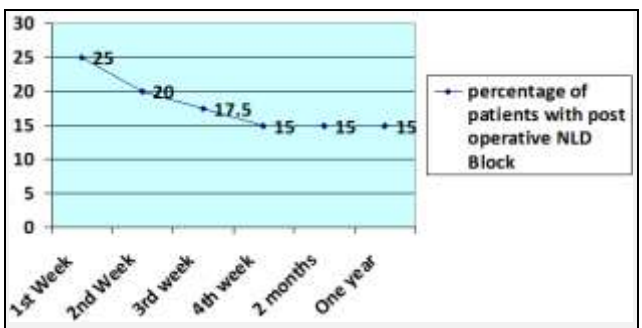
There were septa or membrane covering the probe, which were cut. The membrane was dissected until the probe got exposed. All soft tissue and granulation tissue dissected and removed. Then the bony opening was enlarged with Kerrison bone punch with the diameter of 14 - 16 mm vertical and 12 - 14 mm horizontal. Nasal mucosa was exposed. U shaped single anterior nasal mucosal flaps were made if nasal mucosa was available. The good homeostasis was maintained in this surgical procedure. Tip of the round body needle was broken and made it blunt and straighten to prevent soft tissue damage when it was passed through the NLD system. Eye of the straight round body needle was entangled with 1 - 0 silk suture passed through the inferior puncta then through inferior canaliculi that came out of the common canaliculus to reach the exposed sac area. Then the curved artery forceps was passed through the nose across the bone opening. Then the silk suture was grasped with curved mosquito forceps and pulled out of the nose by railroad technique. A circular loop was created externally (shown figure 3.) which remained in-situ post operatively for 2 months. In some cases where sac tissue and nasal mucosa was not available then, all the flaps were cut, and intubation was done without any flaps. The in-situ circular loop was post-operatively self-rotated by the patients daily to create a permanent fistula tract. Post operatively systemic antibiotic and analgesic were prescribed. Decongestant nasal drops were used for a few days up to one month. Syringing was done from the lower canaliculus. At first, the two silk threads were retracted to open the inferior puncta, then syringing was performed. This is the advantage of introducing double thread 1 - 0 silk suture. Syringing done weekly for the first month then fortnight for 2nd month.

Double threaded silk suture kept in-situ for 2 months. Every day this loop of thread was rotated to some distance both clockwise and anticlockwise direction. These loops of threads were removed by cutting the loop and pulling it from the nasal site. All the patients followed up to one year.

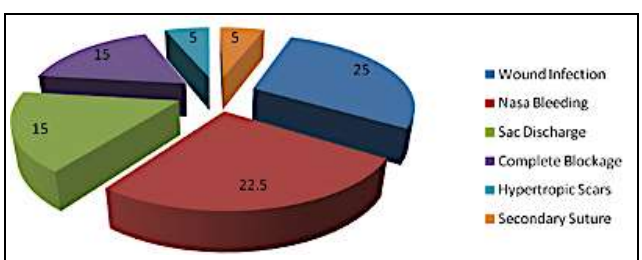
RESULTS

In this study, age ranged from 15 to 55 years, where mean age was 27.026 ± 10.026. The middle-aged females were the most common victims with, male to female ratio being 2:3. The various causes of failures were: 7 (17.5 %) patients underwent endoscopic DCR, 30 (75) patients external DCR and 3 (7.5) patient with primary silicon intubation DCR. In syringing, regurgitation of mucous and fluid was seen from same inferior puncta in 12 (30 %), superior puncta in 23 (57.5 %), and both punctum in 5 (12.5) cases. In patients who had the common canalicular block the following were the causes: membranous block-15 (37.5 %), soft granulation tissue block-20 (50 %) and fibrous tissue block – 5 (10 %). Per operative examination of bone ostium diameter showed that complete obscuration of bone ostium diameter 1 – 5 mm were in 12 (30 %) patients and small inactive diameter ranging from 5 – 10 mm in 28 (70 %) cases. Bone ostium was made in the medial wall of the orbit for new anastomosis. The newly created bone ostia diameters were 14 mm in 22 (55 %) and 16 mm in 18 (45 %) patients. In this study at first, we attempted to perform the flap anastomosis wherever it was possible. The Single anterior flaps were made in 26 (65 %) cases and no flaps were made in 14 (35 %) cases. In all the cases double threaded 1 - 0 silk was introduced as a stent material. Symptomatic post-operative epiphora was present at the end of 1st week-20 (50 %), 2nd week - 16 (40 %), 3rd week-10 (25 %), 4th week - 6 (15 %) and 2 months – 6 (15 %) and finally at the end of one year – 6 (15 %). Post-operative

syringing was done in every patient and results were observed for the patency of the newly made anastomosis. There was a partial block at the end of 1st wk., in 10 patients (25 %), 2nd week - 8 patients (20 %) 3rd- week 7 patients (17.5 %), 4th week - 6 (15 %) patients. At the end of 2 months 6 (15 %) and at last after one year 6 (15 %) patients had complete blockage. Post-operative complications were wound infection – 10 (25 %), nasal bleeding – 9 (22.5 %), secondary suture required in 2 (5 %), Hypertrophic scars – 2 (5 %), discharge from lachrymal sac 6 (15 %) and complete blockages were 6 (15 %) cases. All the complications were treated promptly. Follow up period was 12 months.



Graph 1. Post-Operative Syringing with Partial Block at the End of 1st Week, 10 Patients (25 %), 2nd Week - 8 Patients (20 %) 3rd Week 7 Patients (17.5 %), 4th Week - 6 (15 %) Patients, At the End of 2 Months 6 (15 %) and After One Year 6 (15 %) Patients had Complete Blockage



Graph 2. Post-Operative Complications

DISCUSSION

Various causes of failures include external DCR 75 %, endoscopic DCR in 17.5 % and silicone tube intubations DCR in 7.5 %. In this study the mean age was 27.026 ± 10.02 (range 18 – 55 yrs.) which is similar to the study done by Emine Akaya et al where the mean age was 48.95 ± 12.59 years (range 19 – 69).[30] Regarding the gender in this study, males were 16 (40 %) female were 24 (60 %) and ratio was 2: 3. In the other study Emine akay[30] et al showed that there were 31 females (77.5 %) and 9 males (22.5 %). In this study the majority of the cases belonged to low to middle socioeconomic status. Definitely poor hygiene is one of the causes of chronic dacryocystitis. Epiphora is the leading symptoms. The majority of the cases, duration of the Epiphora was 8 - 12 months. Epiphora was due to blockage of NLD system where thick membranous block – 15 (37.5 %), soft granulation tissue block – 20 (50 %) and fibrous tissue block – 5 (10 %). The granulation soft tissue block was the major cause of the NLD block.[31] Another study by Javed Ali et al[32] shows cicatricial closures of the anastomosis due to inadequate osteotomy and inadequate marsupialization. The least prevalent causes are internal common opening granuloma and grossly lateralized middle turbinate causing ostium obstruction. Another study by Emine okay et al. Showed that epiphora due to blockage of NLD system. Inadequate bone ostium and soft tissue granuloma formation leads to tear drainage blockage. Inadequate bone ostium diameter is one of the major causes of failure. In this study obscuration of bone ostium diameter 1 – 5 mm were in 12 (30 %) cases and small inactive diameter ranges from 5 – 10 mm 28 (38 %) cases. Study by Adam J. Cohen et al showed that majority of the cases had failure due to soft tissue accumulation and inadequate ostium. Failure of primary DCR surgery is mostly due to anatomical and functional block.[33]

It has been observed that important causes of blocks are severe fibrosis at the common canalicular area, excessive proliferation of soft tissue, inadequate size of bone opening, malposition of the bone ostium.[34] Similarly Welham and Wulc studied on failed external failed DCR in their series of 204 cases. They showed that the probable causes of failure are inadequate ostium size or location to be the commonest cause of failure (54.4 %, 111 / 204) followed by common canalicular obstruction (52.9 %, 108 / 204), rhinostomy scarring (13.7 %, 28 / 204), intervening ethmoids (7.35 %, 15 / 204), sump syndromes (4.9 %, 10 / 204), active systemic disease (3.43 %, 7 / 204), and DCR to air cell (2.9 %, 6 / 204). Demarco[35] et al in their study of ten patients of failed external DCR showed that inadequate osteotomy (40 %), obstructive septal deviations (30 %), synechia (20 %), and granulomas (10 %) were being the causes of failure. Joshi studied 50 patients of failed trans canalicular DCR and found inadequate osteotomy in 21 patients, unseen osteotomy site in ten, and common canalicular obstruction in three patients.[36] Narioka et al in their study showed that cicatricial closure of ostium is the common cause failed DCR.[37]

In this series syringing was done in all cases with the object of detecting the level of the block. In syringing the interpretation was as follows e.g. regurgitation from upper punctum without any latency were considered, distal common canalicular block or fibrosed sac. Regurgitation from the same inferior puncta were considered to be proximal common canalicular block or inferior canalicular block.

In this study there is complete clearance of all soft tissues from the anastomotic stoma followed by placement of double thread 1 - 0 silk suture which is passed from inferior puncta, common canaliculi, anastomotic stoma, inferior meatus and finally outside the nose as a loop (Figure 3) This double threaded silk was rotated clockwise and anticlockwise for (10 × 3) 30 times in three different time in a day with some distance. Due to its constant irritation, columnar cell lining change to squamous cell lining makes a smooth fistulas tract. This double threaded silk was retained for 2 months after that it was removed. Importance of double threaded silk is that it generates more irritation during its movement and in syringing both the thread can be retracted to expose the punctal opening for easy cannulation

and syringing. It doesn't require puncta dilatation. In every case, bony opening is made about 14 – 16 mm in diameter. The single anterior flaps anastomosis was performed in 26 (65 %) cases and no flaps anastomosis in 14 (35 %) cases. Postoperative syringing was done in every patient and results were observed for the patency of the newly made anastomosis. There was a partial block at the end of 1st - wk., 10 patients (25 %), 2nd week - 8 patients (20 %) 3rd- week 7 patients (17.5 %), 4th week - 6 (15 %) patients, 2 months 6 (15 %) patients. At the end of one year there was a complete blockage of 6 (15 %) patients. The success rate in this study is 85 %. During the operative procedure, following problems may occur. While passing the eye of the needle through the inferior puncta, canaliculi, the double thread may slip. To prevent this, long loop was used.

Nasal mucosal injuries may be caused by the needle while passing through the bone opening or when curved artery forceps is passed through the bone opening. Curved artery forceps may cause less traumas than straight forceps. Accidental opening of the suture loop can occur. In every patient, it is especially advised to retain it until further advice.

In this study the loop of double thread, silk was maintained for re - canalization or to keep the fistula tract patent. Regular clock or anti-clockwise movement creates a constant chronic irritation. It helps in the development of a permanent fistula. Regular syringing should maintain the patency of the channel for at least two months.

Complication of this surgical procedure were, wound infection - 10 (25 %), nasal bleeding-9 (22.5 %), secondary suture required in 2 (5 %), hypertrophic scars – 2 (5 %), discharge from lachrymal sac 6 (15 %) and complete blockages were 6 (15 %).

CONCLUSIONS

This study shows excessive proliferation of granulation tissue, inadequate bone opening, cicatricial or scaring of anastomosis to be the major causes of failure of DCR. Revision DCR with intubation DCR using 1- 0 silk suture as a stent is quite a useful procedure. Here the post-operative success rate is about 85 %. This procedure is quite easy and can be performed effortlessly by all surgeons. This material is also cost effective and can be performed anywhere whether in rural or urban hospital with minimal resources.

Financial and Competing Interests - None

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