Balloon Dacryoplasty for Congenital Nasolacrimal duct Obstruction

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Congenital nasolacrimal duct obstruction (CNLDO) is a common disorder in infants, with up to 20% of all newborns suffering from epiphora during the first year of life. The underlying cause has been demonstrated in pathological studies to be a membranous obstruction at the distal end of the nasolacrimal duct at the level of the valve of Hasner, where the duct enters the inferior meatus of the nose. This defect is due to a delay in

the complete development of the lacrimal outflow system at the time of birth. Continued maturation of this system occurs postnatal, and spontaneous resolution is the most common outcome. Children who still have epiphora at 1 year of age should have probing and irrigation of the nasolacrimal system. Probing is a highly successful procedure in children which do not respond to conservative treatment. However, failures do occur, with the rate of failure increasing after 12 months of age. The available options for children with persistent symptoms of NLD obstruction following initial probing include repeat probing (under endoscopic guidance if possible), placements of silicone stents and dacryocystorhinostomy.

Balloon catheter dilatation is a relatively new procedure for children especially with complex obstruction which do not respond to simple probing. This procedure involves dilatation of the distal NLD with a balloon catheter under hydrostatic pressure. BCD has a good success rate and offers an alternative to technically more complex lacrimal intubation and avoids the need for dacryocystorhinostomy in pediatric age group.

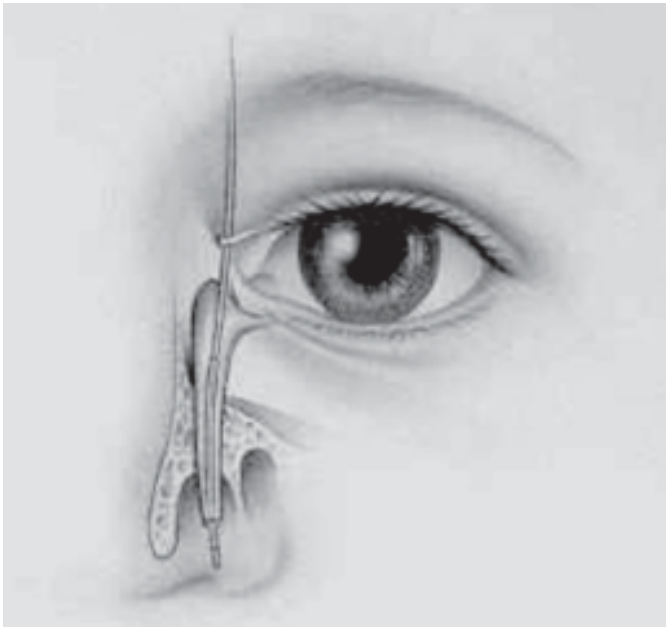

Figure 1: Uninflated balloon catheter in the NLD

Figure 2: Inflated balloon in the NLD

Instrumentation

This consists of an Inflation device and the balloon catheter (Lacricath; Atrion Medical, Birmingham, AL). The inflation device has a connector with a tubing, a syringe with rotatory piston which rotates clockwise and anticlockwise, a manometer, and a locking system. The balloon catheter has a balloon at the distal end , a long probe which is sleeved and the connector.

Fluorescein stained saline is filled in the inflation device and the device is locked, the catheter is connected to the inflation device and when the piston is rotated clockwise the balloon inflates. The pressure inside the balloon is shown by the manometer connected to the inflation device. Upon rotating the piston anticlockwise decreases the pressure inside the balloon which deflates the balloon.

The catheter is available in 2 sizes for pediatric use. A 2mm diameter balloon with a 13mm long working segment for patient less than 30 months and 3mm diameter balloon with 15mm working segment for children more than 30 months. The catheter also has marking to guide the position of the balloon in the distal and proximal segment of the nasolacrimal duct.

Indications of BCD

Failed probing in children above 1 year age (having complex obstruction)

Delayed tear drainage

Recurrent low grade dacryocystitis

Dacryocystocele

Contraindications of BCD

Anatomic malformation of the lacrimal duct or bony canal

Recurrent episodes of active dacryocystitis

Dacryocystolithiasis

Tumor

Chronic Inflammation (Sarcoidosis, TB, Wegeners Granulomatosis etc)

The procedure is carried out under general anesthesia. The lacrimal puncta is dilated and probing is carried in a standard fashion with number 0 and 1 Bowmen's probe. The type of obstruction is confirmed by passage of Bowman probe. Complex obstruction is defined as one in which there was stenosis extending along the length of the distal naso lacrimal duct. The passage of probe in these duct produced a gritty or bony sensation, which felt similar to passing the probe through a sand paper. The deflated balloon catheter (Lacricath; Atrion Medical, Birmingham, AL) is passed through the superior puncta and into the distal nasolacrimal duct, where it is inflated to 8 atm for 90 seconds, deflated and again inflated to 8 atm again for 60 seconds.

This is repeated in the proximal nasolacrimal duct before florescein stained saline is used to irrigate the lacrimal system and fluid is recovered in the nose with a clear suction catheter to confirm the patency of the lacrimal system.

A 3-mm diameter balloon with a 15-mm long working segment is used for patients older than 3 years and a 2-mm diameter balloon with 12 -mm working segment is used for children less than 3 years. Post operative children are treated with betamethasone and neomycin eye drop 4 times daily in tapering dose for a period of 4 weeks. Follow up examination is performed at 1 week and 6 week after surgery. Success is rated as absence of tearing and/or discharges from the eye while perisitance of symptoms and signs of NLD obstruction is considered as failure. Balloon catheter dilatation is a relative new procedure in India, I performed BCD in 8 lacrimal systems of 7 children with complex nasolacrimal duct obstructions age 3-6 years with unsuccessful

Figure 3: Inflation device having a tube which connects to the catheter, a manometer and piston with locking system.

Figure 4: Uninflated balloon catheter

Figure 5: The balloon catheter is placed in the distal nasolacrimal duct

Figure 6: Balloon inflated to 8 atm pressure as shown in the manometer

Figure 7: Checking for patency by irrigating the nasolacrimal duct with fluorescein stained saline while recovering the same from the throat.

probings. All children had complex nasolacrimal duct obstructions which were confirmed prior to BCD. Balloon catheter dilatation was successful in 7 out of the 8 (87.5%) lacrimal systems.

Discussion

Simple probing is highly successful for simple membranous type of NLD obstruction. The results of probing however are poor in children with complex type of NLD obstruction. The options for children with failed probing include repeat NLD probing or lacrimal system intubation. A second probing has been reported to result in a cure rate between 38% to 64%. Silicone intubation although a reliable procedure with reported success rate from 82% to 100% is technically difficult with complications including dislocation of the tube and damage to puctum, canaliculus and cornea. Both probing and silicone intubation work by puncturing the obstruction in the NLD, this might work in few complex obstruction with stenosis extending over a shorter length of the NLD and dacryocystorhinostomy remains the treatment of choice in these children. Balloon catheter dilatation offers a better option in these obstructions by providing expansion along the entire length of the obstruction, thus

decreasing resistance and improving tear drainage. The balloon dacryoplasty system was developed from angioplasty technology by interventional radiologists and was refined by ophthalmologist. The diameter of the uninflated catheter is equivalent to No 1 Bowman's probe. The catheter is fed down the lacrimal system into the nasolacrimal duct. The end of the catheter has a 10 to 15mm balloon that is inflated to 8 atm of pressure within the confines of the distal nasolacrimal duct. Becker and Berry published the first large study using the Lacricath balloon catheter and reported a success rate of 94% done after failed probing. Leuder concluded that balloon dacryoplasty is equivalent to probing alone in simple obstructions but better than probing alone in complex obstructions. Leuder reported a success rate of 75% for BCD done as a secondary procedure. Meyer et al also compared the results of primary and secondary dacryoplasty and found results similar to Leuder. Debate is likely to continue with the many options now available for treatment of congenital nasolacrimal duct obstruction, the indication of balloon catheter dilatation will definitely be more refined with time.

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