Lacrimal Bypass Surgery
“Conjunctivodacryocystorhinostomy”
CDCR

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Core Messages

- Conjunctivodacryocystorhinostomy (CDCR) with the insertion of a bypass tube is a procedure in which a new lacrimal route from the conjunctival sac into the nasal cavity is created and a drainage tube is inserted between the inner canthus and the nasal cavity.

- The CDCR is carried out only in the canalicular obstructions if there is not any other surgical procedure available.

- Despite that minimally 50–60% of patients require replacing a tube within 5 years, the success rate of the procedure varies from 80 to 90%.

- The best thing seems to be Pyrex glass tube, which is used most commonly.

- The tube is considered a life-long prosthesis. If a Jones tube is extruded or lost, the recurrence of symptoms and the opening of the closure can be observed in the course of a few days because of the tunnel’s non-functioning.
Jones tube set-up. A series of curved and straight Jones tubes of varying lengths are shown.
Jones tube

- Pyrex glass, most common
- Silicon
- Medpor-coated tube (Porex Corporation), which allows for ingrowth of fibrous tissue into its outer covering
Indications for Bypass Tube

• Less than 8 mm of residual canaliculi.
• Punctal agenesis.
• Canalicular stenosis
• Sever trauma to the upper and lower canaliculi proximally.
• Following unsuccessful canaliculo-DCR.
• Following canalicular obstruction after canaliculitis involving both canaliculi where canaliculi become obstructed, or the canaliculi stay patent but do not function properly.
• Lid-glob malposition
• Tumors of the inner canthi.
• Failed bypass tube.
Contraindications

1. Patency of the lacrimal system is a principal contraindication for the placement of a bypass tube; however, in severe canalicular stenosis CDCR can be the only effective procedure.

2. Lid malposition is a relative contraindication. A reconstruction of the traumatic eyelid malposition is supposed prior to Jones tube placement. The proper eyelid closure is important, not only for drainage function but also for the fixation of a tube. If there is an orbicularis weakness, e.g., in patients with facial nerve palsy, the performance of surgery is expected to be much worse due to non-functioning of the lacrimal pump and orbicularis. It is because the effect of blinking and lid functioning for drainage function with a bypass tube is fundamental. According to our experience, it is better to make the indication in those patients very carefully.

3. Age of patient is a relative contraindication for reasons of postoperative care and poorer cooperation in small children [24]. We assume the lowest age for the procedure to be 12 years.
Jones bypass tube placement

1. Primary placement of Jones tube
   - With external DCR (EXT-DCR)
   - With endoscopic endonasal DCR (EDCR)

2. Secondary placement
   - Closed placement of Jones tube with endonasal monitoring after failed DCR

3. Replacement Jones tube

Caruncle or eyelid tube placement

Options:
   - Precanalicular (caruncle)
   - Transcanalicular (lower eyelid, medial to the punctum)
Jones bypass surgery

<table>
<thead>
<tr>
<th>Primary placement of Jones tube</th>
<th>Indication</th>
<th>Method</th>
<th>Alternative method</th>
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<tbody>
<tr>
<td>Secondary placement of Jones tube</td>
<td>Extensive canalicular obstruction</td>
<td>Endoscopic endonasal laser or surgical DCR and closed Jones tube placement</td>
<td>External DCR and open Jones tube placement</td>
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<tr>
<td>Replacement</td>
<td>After failed canalicular surgery with DCR</td>
<td>Surgical endonasal endoscopic assisted closed placement</td>
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<td></td>
<td>If tube is lost or buried in</td>
<td>Remove tube and replace with endonasal endoscopic assisted closed technique</td>
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A standard DCR is performed, up to the step of uniting the posterior flaps. A horizontal snip incision is made on the caruncle with a Westcott scissor.

A von Graefe knife is inserted through the incision.
Tube placement

1. Caruncle bipolar electrocautery is performed prior to tube placement to reduce the caruncle (Fig. 12.5). It gives better access to the entry at the medial canthus. Electrocautery is preferred to cutting a caruncle because it makes hemostasis, and the conjunctiva has less tendency to cover the tube.

2. A needle (or a guide wire) is passed in the medial canthus from the site of the caruncle (or anterior/inferior caruncle) into the nasal cavity in the inferomedial direction. Viewing endonasally with Hopkins endoscope can confirm that the needle positioning is correct and the length of the tunnel can be measured.

3. The tunnel is cut with the help of a Graefe knife along a needle into the nasal cavity through the soft tissues while the cornea is preserved with a protector (Fig. 12.6). The opening of the tunnel can be enlarged with moving the knife inferi-
Hypodermic needle has been placed in position between conjunctival sac and dacycystorhinostomy. Needle replaced by cataract knife. Cataract knife replaced by pyrex tube
No. 00 lacrimal probe is placed through the lumen of the needle and used to measure the distance halfway to the nasal septum.
A small-diameter gold dilator is introduced into the track to widen the aperture. A Bowman probe is passed into the lumen of the selected Jones tube, the probe is then inserted into the tissue tunnel until the tip is visualized in the osteotomy.
Proper placement of the pyrex tube
Jones tube in place
Nasal view and (c) CATscan
Nasal cavity and the proper tube position
CDCR performed with iris scissors instead of with needle and knife
Tenotomy scissors are inserted posterior to the medial canthus and direct with blunt and sharp dissection into the lacrimal sac at 45-degree angle. No tissue is resected. The 0.00 Bowman probe with the sized pyrex tube is introduced into the fistula with the scissors still in place.
Jones tube placement

Dacryocystorhinostomy
• Standard external or endonasal dacryocystorhinostomy is performed before tube placement.

Determining the tube position and length
• Choose conjunctival placement of the Jones tube between the plica and caruncle.
• Determine the position and length of the Jones tube using a 20-gauge needle from conjunctiva through ostium.

Placing the tube
• A 6-0 Vicryl suture (Ethicon J-570) is wound around the Jones tube near the flange.

• A 14-gauge intravenous catheter needle and sleeve are placed through the conjunctiva into the ostium.
• The needle is withdrawn, leaving the sleeve in place.
• The Jones tube is inserted into the end of the sleeve (most common size is 4 mm by 17 mm).
• The sleeve is pulled out the nose, bringing the Jones tube into position.
• Proper position and length of tube in the canthus and nose are confirmed.

Suturing the tube in position
• Vicryl suture arms are passed through the plica to pull tissue around the tube and tied.
Fig. 9-24  Jones tube placement (after Dutton). In the example, an external DCR is used. The same technique can be used with an endoscopic approach. A, After the posterior flaps of the DCR are sewn closed, place a 14-gauge sleeved catheter between the plica and the canaliculi and push it into the ostium. B, Leave the sleeve in position as you remove the needle. C, Push the Jones tube into the dilated end of the sleeve. Grasp the sleeve in the nose with a hemostat and pull it out of the nostril, positioning the Jones tube. D, Jones tube in position. The anterior flaps are sewn and the wound is closed. A double-armed 6-0 Vicryl suture is wrapped around the neck of the tube and sewn to the plica.
Angled Extended Jones Tube

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The modified Jones tube, with an extended length of 24 mm and an angle of 130-degree in the middle
Transcaruncular approach. The lacrimal bone is perforated using a 14-gauge needle. The surgical tract is dilated with a 2.4-mm dilator. The position of the dilator in the nose is controlled with the suction cannula. The tube is inserted manually.
Position of the angled extended Jones tube in relation to the lacrimal system and nasal cavities. The angled portion of the tube lies in the nose.
Rate and Time of Occurrence of Complications in 30 Angled Extended Jones Tube

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<tr>
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<th>Rate (Eyes, n)</th>
<th>Mean Time [mos (Range)]</th>
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<tr>
<td><strong>Tube complications</strong></td>
<td></td>
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<tr>
<td>Nasal displacement</td>
<td>12% (11)</td>
<td>4.7 (0.1–42.9)</td>
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<tr>
<td>Lateral displacement</td>
<td>11% (10)</td>
<td>4.8 (0.1–43.1)</td>
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<tr>
<td>Not patent</td>
<td>4% (4)</td>
<td>5.8 (0.2–22.5)</td>
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<tr>
<td><strong>Conjunctival complications</strong></td>
<td></td>
<td></td>
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<tr>
<td>Conjunctival overgrowth</td>
<td>3% (3)</td>
<td>20.8 (2.0–57.5)</td>
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<tr>
<td>Granulation tissue</td>
<td>2% (2)</td>
<td>1.5 (1.4–1.6)</td>
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Techniques for tube placement

- In primary placement a standard external DCR with a large rhinostomy is performed, where the nasal space can be visualized both directly and endoscopically.
- Primary laser endonasal endoscopic DCR enables rapid tube placement and provides a tight ostium around the tube, which may provide greater stability.
- In those cases where an initial canaliculo-DCR or related type of operation has failed and there is already a bony rhinostomy secondary placement is easy.
Secondary Jones tube placement

a) the previous DCR site is outlined - in this area, there is no intervening bone, only soft tissue. 

b) Local anesthesia injected into lateral nasal wall
a) K-wire. Note size of wire compared to biro.
b) K-wire is passed down through the lower eyelid posterior lamella into the nose, keeping it in the plane of the iris, taking care not to direct posteriorly. This patient has an artificial eye.
c) Tip of K-wire visible in sub-mucosa.
d) K-wire emerging into nose through old DCR site. Correct positioning.
a) 5 cm long trephine and stent, and sharp tip of trephine.
b) With the K-wire in situ, the trephine is threaded over it.
c) The trephine is advanced through the soft tissue to the nose and a core of tissue removed. This is repeated.
d) Both the K-wire and the trephine can be seen in the nose.
e) Just the trephine is visible endonasally, as it advances past the tip of the K-wire.
a) A typical glass Jones bypass tube.
b) The Jones tube is passed down over the K-wire.
c) The K-wire is removed once the tube is in place.
d) The endonasal position of the distal end of the tube is checked.
One week after secondary Jones tube placement, showing normal functional endoscopic dye test.

a) Good tube position.

b) Fluorescein has filled lumen and splashed inside nose.
Primary holmium laser-assisted Jones tube placement.

a) The K-wire is pushed through to the correct position on the lateral nasal wall, and the three instruments are in the nose: Hopkins endoscope, laser tip and smoke sucker. View of eye and nose from below.

b) The Jones tube is passed down over the K-wire into the nose, with endoscopic monitoring.
a) Nasal mucosa and bone surrounding K-wire is ablated by holmium laser (10 W). Marked tissue char is noted. Alternatively, KTP laser may be used.
b) The Jones tube is passed down over the K-wire.
c) The K-wire is removed, leaving the tube in place.
d) Appearance 1 week after surgery with positive functional endoscopic dye test.
A suture is placed around the Jones tube collar to stabilize it.

a) The 6.0 Prolene suture is passed through the lower eyelid from the skin to the conjunctival surface, then wrapped around the tube collar, keeping the K-wire in situ.

b) The suture is brought out to the skin surface and knotted. The K-wire can then be removed.
Proximal end of tube. Normal tube position in anterior inferior caruncle. There is no tube-eye touch on adduction, or displacement on abduction. This tube functions well.
Right functioning Jones tube. Note the normal rocking movement of the distal end of the tube.

a) Tube faces downwards and is long.

b) Tube is horizontal and shorter. This also shows a fluorescein drop, indicating a positive functional endoscopic dye.
Gold dilator in place after Pyrex tube removed for cleaning.
A pyrex tube being cleaned with alcohol soaked cotton. Ultrasonic cleaning may also be used. Ideally the tube is removed, cleaned, inspect, and possibly exchanged once a year.
Complications of Jones tube insertion

- Hemorrhage
- Patient Dissatisfaction
- Extrusion - loss
- Breaking of the Jones Tube
- Migration of the Tube
  - Inward, Superior migration, Inferior migration, Lateral migration
- Plugging of the tube
- Granulation formation
- Drug toxicity
- Diplopia
- Buries in/conjunctival overgrowth
- Nasal mucosal overgrowth obstructs drainage
- Wrong angle causes intermittent function - e.g. only on abduction
Prevention of tube extrusion

- Interomedial direction of the tunnel (tube)
- The tunnel is not to be very wide
- Suturing of a tube with the skin (eyelid)
- Puttermann modified tubes with a double flange
- Blowing one’s nose with closed eyelid or with a finger over the medial canthus
- Angled glass tubes