

## Endoscopic Endonasal Dacryocystorhinostomy Vs LASER-Assisted Dacryocystorhinostomy: Comparative Study

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### Abstract

**Aims:** The present study was performed to compare the successful outcomes between endoscopic endonasal dacryocystorhinostomy (EEDCR) and LASER-assisted dacryocystorhinostomy (LDCR).

**Subjects and methods:** The trial included 50 patients (10-62 years old) who suffered chronic nasolacrimal duct obstruction (CNDO) with no response to conservative and medical measures for several weeks. The patients were divided into two groups according to the surgical intervention used; EEDCR and LDCR (25 patients each). For both EEDCR and LDCR, bicanalicular silicone stents were utilized which were removed from all patients after 4 to 6 months of the interventions. The general-anesthesia-based surgical operations were done in Al-Diwaniyah General Teaching Hospital, Diwaniyah City, Iraq, during the period between February, 2013 to February, 2015. The success of each surgical intervention was decided via the absence of epiphora (subjective) and patency of lacrimal system on irrigation (objective). Follow-up of the patients was continued for 7 to 14 months.

**Results:** Although the average time spent for the EEDCR surgery, 38mins, was significantly ( $p<0.05$ ) longer than that taken for the LDCR, 25mins, the EEDCR number, 20 (80%), of patients who showed absence of epiphora was significantly ( $p<0.05$ ) higher than that, 16 (64%), from the LDCR patients. On the other hand, 9 (36%) of the LDCR patients significantly ( $p<0.05$ ) developed postoperative adhesion, while only 5 (20%) of the EEDCR patients suffered this complication. For surgical revisions, two cases from each group demonstrated full recovery raising the success rate up to 88% and 72% in EEDCR and LDCR, respectively.

**Conclusion:** Although the time of the surgical operation in the LDCR is lesser than that in the EEDCR, the later represents the most successful surgical intervention to correct chronic nasolacrimal duct obstruction with no response to conservative and medical measures.

**Keywords:** DCR, endoscopic endonasal dacryocystorhinostomy, LASER-assisted dacryocystorhinostomy.

### Introduction

In 1904, Toti was the first who demonstrated the Dacryocystorhinostomy (DCR) for the treatment of chronic nasolacrimal duct obstruction (CNDO)<sup>1</sup>. Later on, a sequence of reports described the DCR but in increased rates of success by directly suturing the mucosal-flap edges of the nasal and lacrimal sacs<sup>2,3</sup>. Two decades following Falk work, an improving step was added by using silicone intubation<sup>4</sup>. Since that time until now, DCR is considered the best surgical interventional procedure available for the treatment of CNDO<sup>5</sup>.

Although the old-fashioned DCR, external DCR, was a good choice for CNDO correction, the procedure had faced numerous drawbacks such as bleeding (pre- and post-operatively), long time of procedure and recovery, and development of facial scar. To overcome those obstacles, surgeons developed some techniques with higher rates of success by using the endonasal LASER-assisted DCR (LDCR) for the first time in 1990<sup>6</sup>. The benefits of using LDCR may be indicated by the low rates of tissue damages accompanied by sufficient osteotomy, low occurrence of facial scar, no importance of general anesthesia, reduction of hemorrhage, and

fast-time surgery<sup>7,8</sup>. With all those advantages, LDCR still has unclear rates of success regarding anatomical and functional properties that might post-operatively appear.

The endoscopic endonasal dacryocystorhinostomy (EEDCR) was first introduced in 1989 by McDonogh and Meiring<sup>9</sup>. The procedure has several advantages relying on the experience of the surgeon; however, they are, but limited to, reduction of the medial-orbital-tissue based trauma, low incidence of facial scars, normal pumping mechanism of lacrimation, and low occurrence of medial palpebral ligament and angular vessel damages<sup>10</sup>.

The present study was performed to compare the successful outcomes between endoscopic endonasal dacryocystorhinostomy (EEDCR) and LASER-assisted dacryocystorhinostomy (LDCR).

## **Subjects and methods**

### **Subjects**

The current work was initiated according to the principles of Declaration of Helsinki. The trial included 50 patients (10-62 years old) who suffered chronic nasolacrimal duct obstruction with no response to conservative and medical measures for several weeks. All patients were exposed to routine ophthalmic-based examination included the checking of anterior segments, intraocular pressure, visual acuity, fundus-related examination, and 26-gauge-needle-based lacrimal drainage irrigational checking of any obstructions. The patients were dacryocystographic-explored using lipiodol ultra fluid contrast agent at 0.5ml (480 mg/10ml) (Guerbet, France).

### **Techniques**

The patients were divided into two groups according to the surgical intervention used; EEDCR and LDCR (25 patients each). For both EEDCR and LDCR, bicanalicular silicone stents were utilized which were removed from all patients after 4 to 6 months of the interventions. The general-anesthesia-based surgical operations were done in Al-Diwaniyah General Teaching Hospital, Diwaniyah City, Iraq, during the period between February, 2013 to February, 2015.

The general anesthesia was assisted by applying an intra-nasal cavity lidocaine spray (Vemcaine Pump Spray 10%, VEM Medicine, Turkey) and a decongestant spray (Iliadin, Santa Farma, Turkey).

The site of the operation was povidone-iodine-10%-supplied for an antiseptic procedure followed by dilating the lower canaliculi with Bowman probes. A zero-degree-angled rigid nasal endoscope was entered the nose. Multidiode-enhanced LASER (Intermedical Multidiode S-30 OFT) was employed at 10W, 400ms of pulse, and 400ms of pause and contact modes. The probe, 600µm, used was inserted into the lacrimal sac using the upper and lower canaliculi as passages for the probe. The procedure included applying a 980-nm-diode laser to perform the biggest possible osteotomy. Then, the osteotomy affected area was introduced into steps of expansion at 8-10mm in diameter, coagulation with a diode-laser, and removing of carbonized tissues. After that, the nasolacrimal passage was cleansed by using 0.9% NaCl based upper and lower punctum irrigation.

The EEDCR included complete mucoperiosteal flap elevation over lacrimal sac 5 mm above axilla of middle turbinate down to middle turbinate mid point, then resecting ascending process of maxilla with adjacent lacrimal bone exposing lacrimal sac which incised, bicanalicular silicone inserted and both sac and mucosa flaps appositely replaced with light packing. The steps were followed from<sup>11,12</sup>.

The success of each surgical intervention was decided via the absence of epiphora (subjective) and patency of lacrimal system on irrigation (objective). Follow-up of the patients was continued for 7 to 14 months.

### **Statistical analysis**

The collected data were processed using GraphPad Prism v7.00 software (California, USA). Student-*t*-test was performed. Data are presented as mean±SE; otherwise mentioned. The null hypothesis was rejected if *p* was <0.05.

## Results

Although the average time spent for the EEDCR surgery, 38mins, was significantly ( $p=0.0003$ ) longer than that taken for the LDCR, 25mins (figure 1), the EEDCR number, 20 (80%), of patients who showed absence of epiphora was significantly ( $p= 0.002$ ) higher than that, 16 (64%), from the LDCR patients, figure 2.

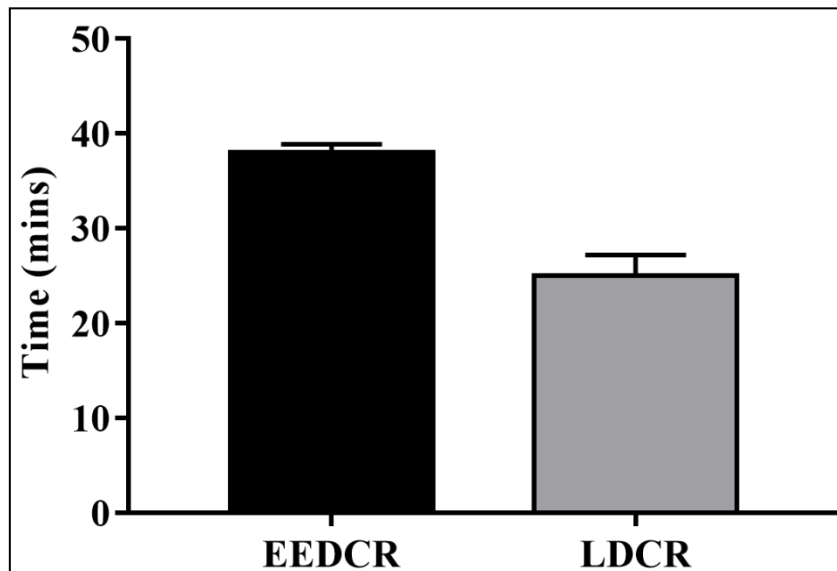


Figure 1: Time average spent in EEDCR or LDCR.

Significant ( $p=0.0003$ ) longer time was spent in EEDCR.

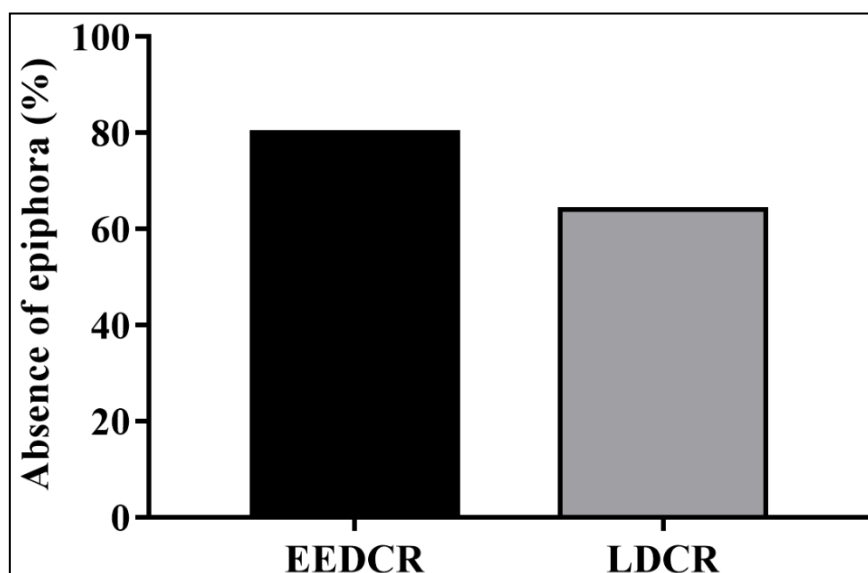
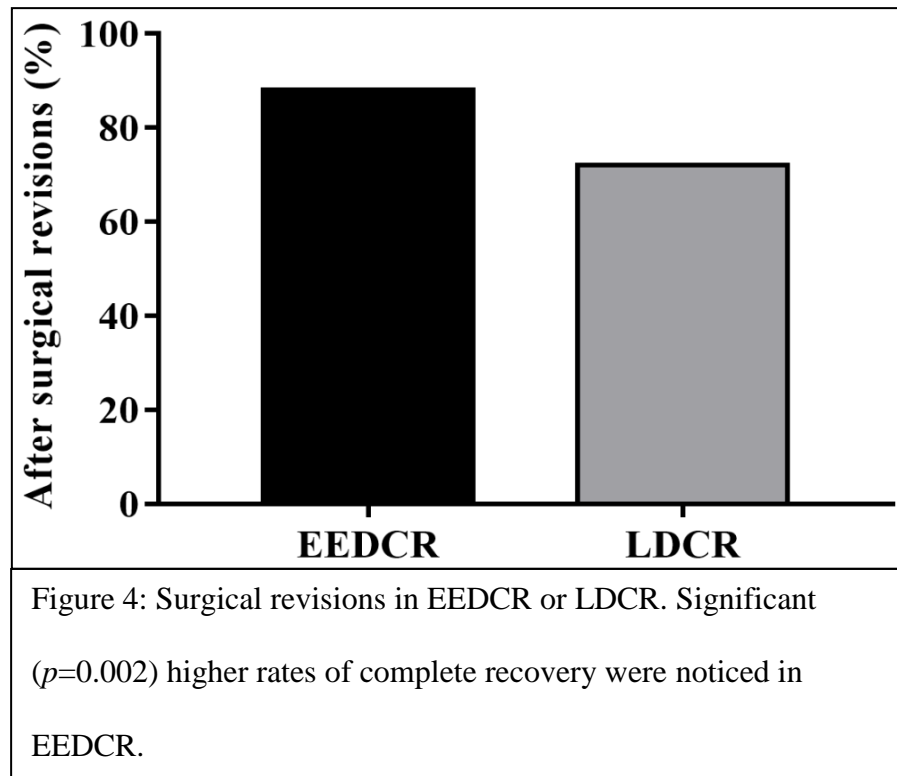
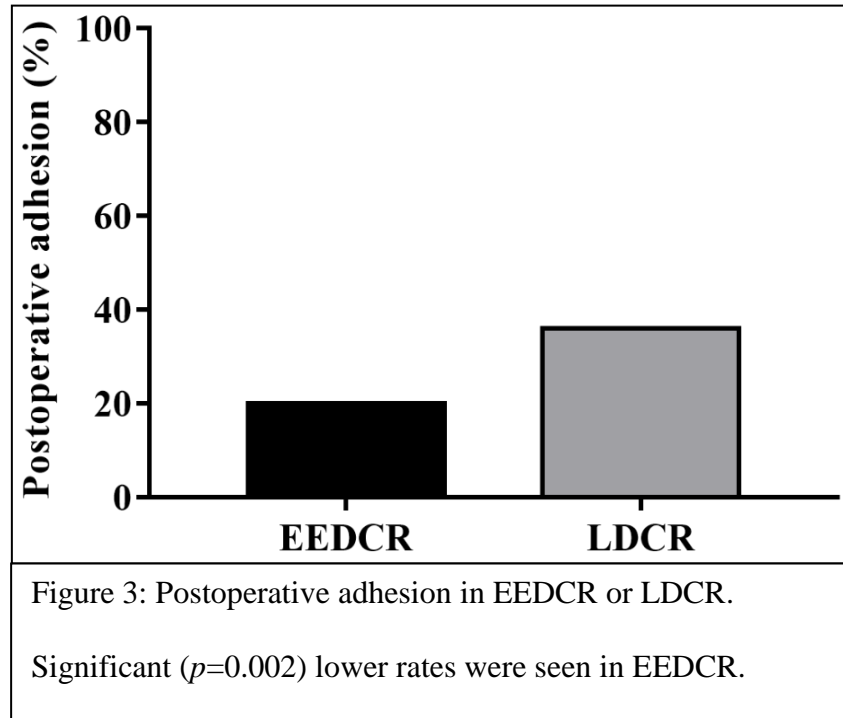


Figure 2: Absence of epiphora in EEDCR or LDCR. Significant

( $p=0.002$ ) higher rates were seen in EEDCR.



On the other hand, 9 (36%) of the LDCR patients significantly ( $p= 0.002$ ) developed postoperative adhesion, while only 5 (20%) of the EEDCR patients suffered this complication, figure 3.

For surgical revisions, two cases from each group demonstrated full recovery raising the success rate up to 88% and 72% in EEDCR and LDCR, respectively, figure 4.

## Discussion

With all the known advantages of the LDCR, success rates regarding anatomical and functional properties probably post-operatively appear are still struggling. The current work was intended to inform a comparative analysis of the successful and downside outcomes of both EEDCR and LDCR.

The results of the present study showed that the time spent in performing the LDCR was lesser than that in EEDCR. This completely agrees with information by<sup>13</sup> who mentioned that the LDCR needs shorter time duration than that in EEDCR; however, the LASER-based operation requires extensive experience with optimum precaution measures, expensive tools and equipment, and shows low rates of success. It has been reported that the success rate of the LDCR was lower than the EEDCR, who documented that 15% of the patients failed to recover after LDCR, while only 5% showed unsuccessful EEDCR<sup>14</sup>.

The outcomes revealed lower occurrence of epiphora in the EEDCR patients than that in the LDCR patients. This piece of information matches up with significant data observed by (Aksoy *et al.*, 2018) who recorded lower successful rates from LDCR; however, they concluded that these results could have been due to the low number of their cases<sup>15</sup>.

The findings also demonstrated lower appearance of postoperative adhesion in the EEDCR subjects than that from the LDCR patients. The current data agree with<sup>16</sup> who reported complications after using LDCR.

The results of surgical revisions elevated the success rates of the EEDCR to outcompetethe LDCR. Our results, here, come in agreement with who reported 100% correction of all failed cases of the EEDCR which were very few in numbers out of 578 patients<sup>17</sup>.

**Conclusion:** Although the time of the surgical operation in the LDCR is lesser than that in the EEDCR, the later represents the most successful surgical intervention to correct chronic nasolacrimal duct obstruction with no response to conservative and medical measures.

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