Numerous theories exist to explain tear transport which indicate the complexity of the mechanism. No one concept is entirely satisfactory. Various opinions exist to explain which part or parts of the tear conducting channels and which phase of lid movements are most essential for the conveyance of tears. One concept is that the tear sac is compressed on lid closure leading to its evacuation, and on lid opening the sac expands and the tears are sucked into the canaliculi. The opposite view to this is that contraction of the orbicularis expands the tear sac, and sucking tears. Relaxation of the muscle leads to elastic contraction of the lacrimal sac, and its evacuation.

This study comprised fifty-eight cases (eighty-six sides) that attended to the Ophthalmologic and/or Otolaryngologic out-patient's clinics at Kasr El-Aini, and/or Madinet Nasr Hospitals during the period from November 1993 to May 1996. They were divided into four groups; healthy, diseased (epiphoric), endoscopic ***DCR***, and external ***DCR*** groups. The endoscopic ***DCR*** group included small and large fistula procedure, and the external ***DCR*** group comprised those with or without silicone rod tubing.

In this study pressure changes within the lacrimal sac were recorded in the four groups during blinking, forced blinking, nasal respiration, side to side eye movement, and Valsalva's maneuver. This was done by means of a metal cannula inserted into the lacrimal sac and the pressure tracings were recorded by a transducer-amplifier-recorder system.

In healthy individuals, air bubbles and saline reflux from the non-cannulated punctum were noticed after saline injection into the lacrimal sac. There was no sac swelling and saline was immediately tasted in the mouth. The pressure in the sac rapidly increased, then rapidly returned to zero. On the other hand in the diseased subjects there were a purulent or

mucopurulent reflux from the noncannulated punctum, swelling of the sac, no saline taste, and a persistent pressure increase that failed to decrease.

Lacrimal sac pressure during blinking and forced blinking displayed a negative pressure in all healthy cases, which indicates lacrimal sac expansion during lid closure. On the other hand, all diseased cases displayed a positive pressure which indicates nasolacrimal duct obstruction. During nasal respiration, and side to side eye movement in both healthy and diseased cases, the lacrimal sac displayed negative and positive pressure changes without any persistent configuration. During Valsalva's maneuver the lacrimal sac pressure in both groups was not affected most probably due to the presence of valve of Hasner in healthy individuals , and obstruction of nasolacrimal duct in the diseased cases.

Three causes of lacrimal sac obstruction were met in this study: dacryocystitis, congenital nasolacrimal duct obstruction, and facial trauma affecting the nasolacrimal duct. ***DCR*** operation was performed to connect the lacrimal sac directly to the nasal cavity to bypass obstruction in the sac or in the nasolacrimal duct.

In successful endoscopic and/or external operations, injection of saline in the lacrimal sac, gave the same picture of the healthy individuals due to the presence of a patent fistula. They displayed negative lacrimal sac pressure during blinking and forced blinking, but it was less in amount than that of healthy cases due to the presence of patent fistula. In contrast to healthy measures, the pressure was positive during Valsalva's maneuver because the fistula transmitted the high nasal pressure to the sac. It was noticed that the pressure was highly positive in successful external ***DCR*** than that of endoscopic ***DCR*** due to the very wide fistula in the former. This

wide fistula was also the cause of recurrent dacryocystitis as it may facilitate ascending infection from the nose.

Failed endoscopic and/or external ***DCR*** operations presented with mucoid, mucopurulent or purulent reflux from the non-cannulated punctum, and lacrimal sac swelling during saline injection. Delayed or absence saline taste, and delayed, or failure of pressure to descent depended on the presence of partial or complete obstruction of the fistula after operation. Moreover, a positive pressure was displayed during blinking and forced blinking. In contrast to the diseased cases, a positive pressure was noticed during Valsalva's maneuver, which may be due to presence of partial obstruction, or a complete obstruction of the fistula by a membrane.

There was no apparent relation between the size of the created fistula (small or wide) and the success rate in cases of endoscopic ***DCR***.

The silicone tube of endoscopic ***DCR*** was removed after a period of 6 month, which was enough to prevent wound contracture. Immediate post-operative epiphora usually due to canalicular swelling from the passage of the tube. In successful cases this epiphora usually disappeared after a period of one week up to 3 months.

Dacryocystitis and nasal infection affected the results, so medical treatment of dacryocystitis, and nasal hygiene were recommended.

It was concluded that, during lacrimal sac irrigation, the sac does not swell in normal and successful ***DCR***, and the subject tastes slain rapidly in his mouth, but swelling in the medial canthal area was noticed in patients with epiphora due to nasolacrimal duct obstruction and failed operations with discharge from the non-cannulated punctum, and the patient does not taste saline at all or may tastes it after some delay. The lacrimal sac pressure tends to be negative during blinking and forced blinking in normal healthy

subjects and successful endoscopic or external ***DCR*** operations, denoting expansion of the sac during both these actions. Positive lacrimal sac pressure was observed in diseased (epiphoric) subjects and failed endoscopic or external ***DCR*** operations. Valsalva's maneuver has no effect on the sac pressure in healthy and diseased subjects, but increases the pressure after ***DCR*** operation either endoscopic or external, unless complete reobstruction of the of the fistula will occurred, in which no change will occur. There is no satisfactory impression about the sac pressure during nasal respiration and side to side eye movements. The endoscopic ***DCR*** approach had several advantage over the external approach in this study as it was less traumatic, avoided facial wound and scar, the attachment of orbicularis oculi to the lacrimal sac not disturbed that preserved the pump action, lacrimal sac was accessed directly avoiding double-side dissection of the sac, and possibility of ascending infection was less. There was no significant difference in the success rate between large and small fistula in endoscopic ***DCR***.

Farther studies are recommended about: the effect of eye movement and nasal respiration on the lacrimal sac pressure, longer period of follow up, randomized selection of external and endoscopic ***DCR***, the difference between small and wide fistula endoscopic ***DCR***, and the effect of wide fistula on tear elimination, and ascending infection.