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# CONGENITAL NASOLACRIMAL DUCT OBSTRUCTION IN KAYSERİ, TURKEY*

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**SUMMARY: Ekinciler ÖF, Doğan H, Tatlışen N, Karaküçük S. (Department of Ophthalmology, Erciyes University Faculty of Medicine, Kayseri, Turkey). Congenital nasolacrimal duct obtruction in Kayseri, Turkey. Turk J Pediatr 1994; 36: 21-33.**

**Congenital nasolacrimal duct obstruction was diagnosed in 170 patients between 1982 and 1991 in Kayseri, Turkey, and 111 patients were treated with massage plus topical antibiotics (MBC), pressure irrigation (PI), probing (PRB) or infracturing of the inferior turbinate (INF). The ages of the patients ranged from one week to 15 years. The obstruction was bilateral in 38 patients.**

**Among the 149 obstructed lacrimal drainage systems of 111 patients, 101 were cleared by MBC (67.8%), 30 by PI (20.1%), eight by PRB (5.3%) and two by INF (1.3%). Eight cases were unsuccessful (5.3%), and the overall success rate was 94.6%.**

**The efficacy of four interventions was correlated to the patients' ages and to the presenting pathology. MBC carried out at the serofibrinous stage and at 7-13 months was more effective than other interventions, with a statistical significance ($p < 0.01$).**

**The effectiveness of four interventions is discussed, with an emphasis on the importance of early MBC. The importance of fluoroscopy during PI or PRB is also emphasized.** *Key words: nasolacrimal duct, neonatal dacryocytitis, pressure irrigation, probing, fluoroscopy.*

Early inflammation of the lacrimal sac and congenital nasolacrimal duct obstruction (CNLDO) is a common disorder encountered by ophthalmologists and pediatricians. Although it is generally agreed that the canalization of the lower end of the nasolacrimal duct (NLD) is completed by the 8th or 9th month of intrauterine life, some authors have suggested that this happens just before birth[1]. If the nasal orifice of the NLD is obstructed by a membranous process called the valve of Hasner, epiphora and dacryocystitis can develop. If this obstruction is not cleared, fibrosis of the duct, mucocele, pericystitis, fistula or even orbital cellulitis can occur. The incidence of CNLDO is the subject of some conflict, reported as 1.75-6%[2,3], 5-15%[4] or 20%[5] by different authors. Cassady[6], in a study of stillbirths, found that 13 of 15 NLDs were obstructed. Nordlaw and Vennerholm[7], in an investigation of 100 patients with CNLDO, found that the failure originated

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from the punctum and canaliculi in 12, from the duct and canaliculi in 21, and from the NLD in 67. Abnormalities within the nasal passages, such as the impaction of the inferior turbinate on the opening of the NLD, may also contribute to the obstruction of the duct[8].

Clinically, infants with CNLDO usually present with epiphora or discharge of various types in their eyes. The initial serous discharge becomes fibrinous and later on, purulant. At this stage, copious mucopurulent secretion emerges when the lacrimal sac is compressed[9].

There is much controversy as to the appropriate management of CNLDO. It is stated that massage applied to the sac plus topical antibiotics is highly successful in relieving the obstruction. Price[10] found that the cure rate by this approach was 94.6% by the age of 2 years in a study of 203 patients.

Guerry and Kendig[3] stated that this approach was highly successful in their series. Nucci et al[11] also obtained a cure rate of 93% for children aged 1-12 months, and 79% for those aged 1-2 years with this conservative approach.

If massage and / or topical treatment (MBC) proves ineffective, pressure irrigation (PI), probe application (PRB), infracturing of the inferior turbinate (INF) or silicone intubation[12] may be performed as further procedures of choice. One of the standard dacryocystorhinostomy techniques may be performed as the last procedure, should all other procedures fail.

The purpose of this study was to discuss the effectiveness of MBC, PI, PRB or INF in the treatment of CNLDO. The effectiveness of various forms of therapy was also correlated to different age groups as well as to the presenting pathology (serofibrinous or purulant) of the obstruction.

The importance of early conservative treatment at the serofibrinous stage is also emphasized. A novel technique of probing carried out essentially under fluoroscopy, with a potential of more satisfactory results and less complications, is also discussed.

## Material and Methods

One hundred and seventy patients with CNLDO were evaluated in this study. The patients were referred to the ophthalmology clinic of Erciyes University Hospital between 1982 and 1991. Fifty-nine of these patients failed to come to the clinic for follow-up and thus were eliminated from this study.

Of the remaining 111 patients, 65 were male (58.6%) and 46 female (41.4%). The ages of the patients ranged from one month to 15 years. Obstruction was bilateral in 38 patients (34.2%). Hence, 149 lacrimal drainage systems were evaluated. In an attempt to evaluate the effectiveness of treatment in different age groups, five

groups were formed. The distribution of the lacrimal drainage systems to five age groups were as follows:

0 - 6 months: 36 systems (24.2%)
7 - 13 months: 36 systems (24.2%)
14 - 18 months: 13 systems (8.7%)
19 - 24 months: 21 systems (14.1%)
24 + months: 43 systems (28.9%)

The secretion was serofibrinous in 98 systems (65.8%) and purulent in 51 (34.2%). Regardless of the age of the patients or the presenting pathology, the regimen was started without delay. The treatment consisted of four consecutive procedures designed such that only those who did not benefit from the previous procedure were referred to the next.

As an initial step, conservative treatment which consisted of massage together with administration of 7% sodium biborate eye solution and 10% chloramphenicol eye drops (MBC) was applied to all patients for three weeks.

Massage instruction was given as follows: The lower punctum was occluded and the sac compressed by the index finger, which stroked downwards along the path of the NLD. This maneuver was repeated 15 to 20 times a day. With the help of this maneuver, the hydraulic pressure within the sac was increased and the likelihood that the obstruction would be cleared was increased[13]. The treatment was continued for another three to four weeks regardless of the outcome of the therapy. Those who did not benefit from MBC after six or eight weeks were referred to the operating room for PI under general anesthesia. PI was performed by inserting a nasolacrimal cannula via the upper punctum, occluding the lower punctum with forceps to increase the hydraulic pressure inside the sac. Dacryocystograms were obtained before and after PI in order to visualize the nasolacrimal system.

Probing via the upper punctum was performed with a Bowman probe if the PI failed to clear the obstruction. An image intensifier fluoroscope (WHA - Shimadzu) was used in the operating room and probing performed under its guidance; in addition, photographs were obtained from the fluoroscopy screen (Canon AE - 1 camera, f: 35 / 105 mm; OrWo Black White 80 ASA film, processed for color printing with Fujicolor paper).

A careful intranasal examination was done in all cases. If the inferior turbinate seemed to be impacted on opening of the NLD, it was pushed medially and cracked in an upward rotation with a periosteal elevator. The probe was then inserted from the upper punctum and passed into the inferior meatus. Irrigation was repeated thereafter to confirm the patency of the passage.

During this procedure, patients, doctors and technicians were protected by lead

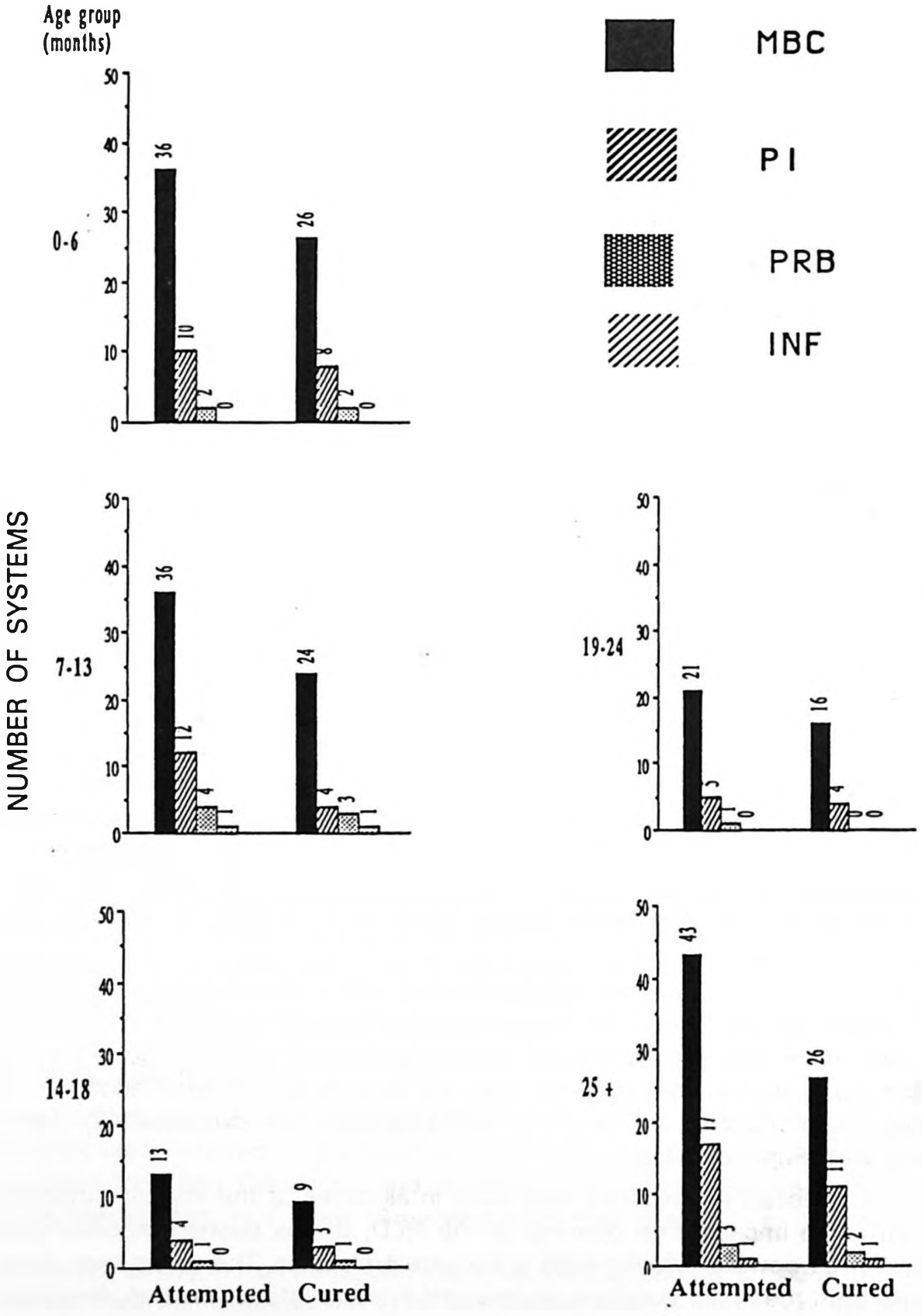


Fig. 1: Results of massage + biborate + chloramphenicol (MBC), Pressure irrigation (PI), probing (PRB) or infracturing of the inferior turbinate (INF) correlated to age. The difference is not statistically significant ($p > 0.05$).

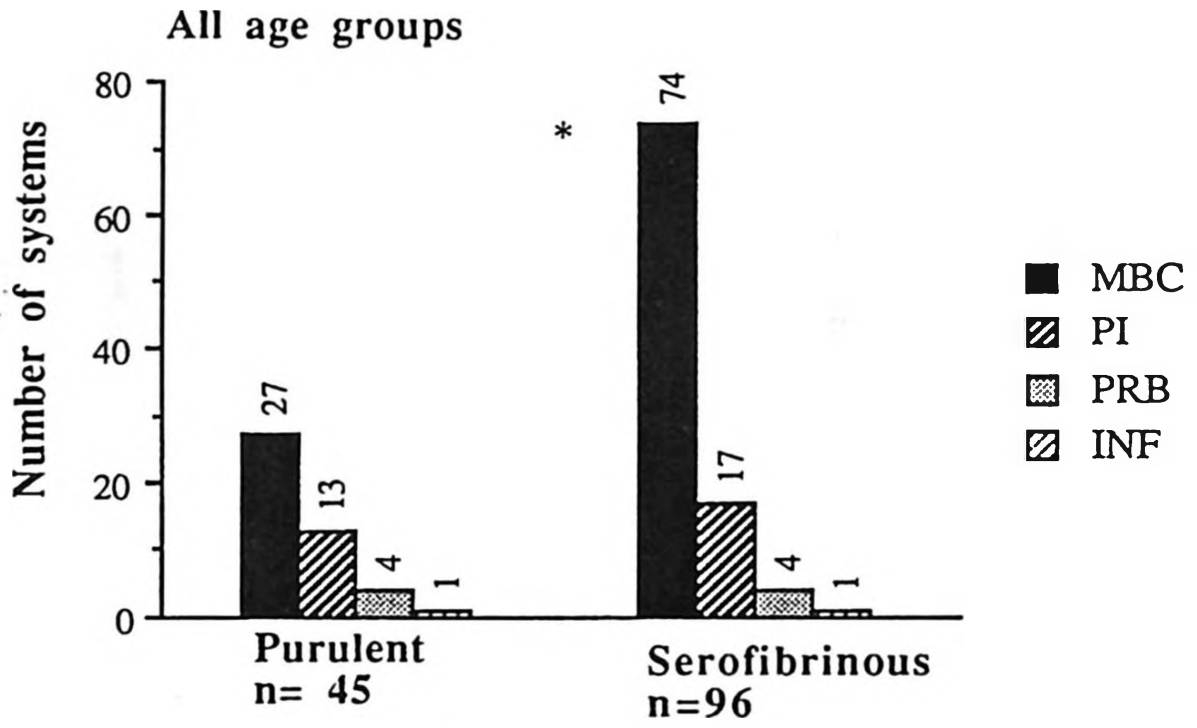


Fig. 2: Successful results (141 nasolacrimal systems) correlated to presenting pathology. MBC carried out at serofibrinous stage is more effective than that carried out at purulant stage ($^{*}$ $p < 0.01$).

aprons or gonadal shields from possible harmful effects of radiation. The procedure lasted approximately 2.5 minutes at 90 kVp, 2 mA, and the estimated radiation dose received by the patient was calculated as 10 rad. During dacryocystography, the dose received by the skull was estimated to be approximately 500 mrad[14]. Dacryocystograms (DCG) were performed before and after PI (Figs. 4, 5, 6) and fluoroscopic pictures obtained (Fig. 7).

Follow-up time for the patients was at least one year after the final procedure, with an average of 4.9 years (range: 1-8 years). Patients were seen regularly at one week, two weeks, and one month after the last procedure, and once or twice per year thereafter according to their symptoms. The treatment was regarded as successful when tearing and discharge ceased. Families of the patients were advised to return to the clinic should symptoms persist.

## Results

One hundred and forty-nine obstructed lacrimal drainage systems of 111 patients were analyzed; 101 systems were cleared by MBC alone (67.8%). Among the remaining 48 that did not benefit from MBC, relief was obtained in 30 by PI (20.1%). Of the remaining 18 systems where PI was ineffective, eight benefitted from PRB (5.3%) and two from INF (1.3%). Eight cases were unsuccessful (5.3%), whereas 141 obstructed systems of the total of 149 were cleared by one or more interventions producing an overall success rate of 94.6%.

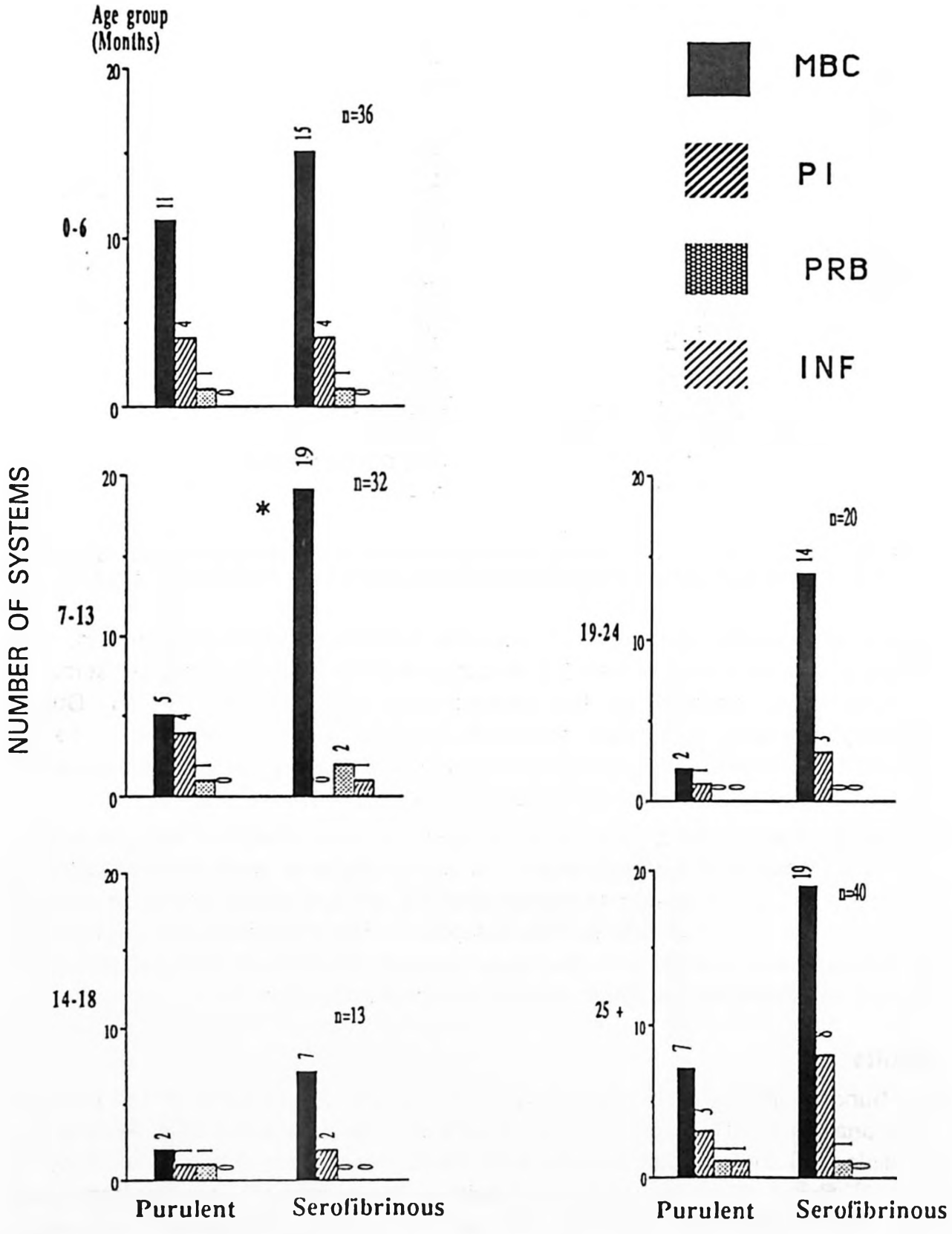


Fig. 3: Successful results (141 nasolacrimal systems) correlated to presenting pathology and to age. MBC caried out at 7-13 months at serofibrinous stage is more effective than that carried out at other age groups or at purulent stage ($^{*}$ $p < 0.01$).

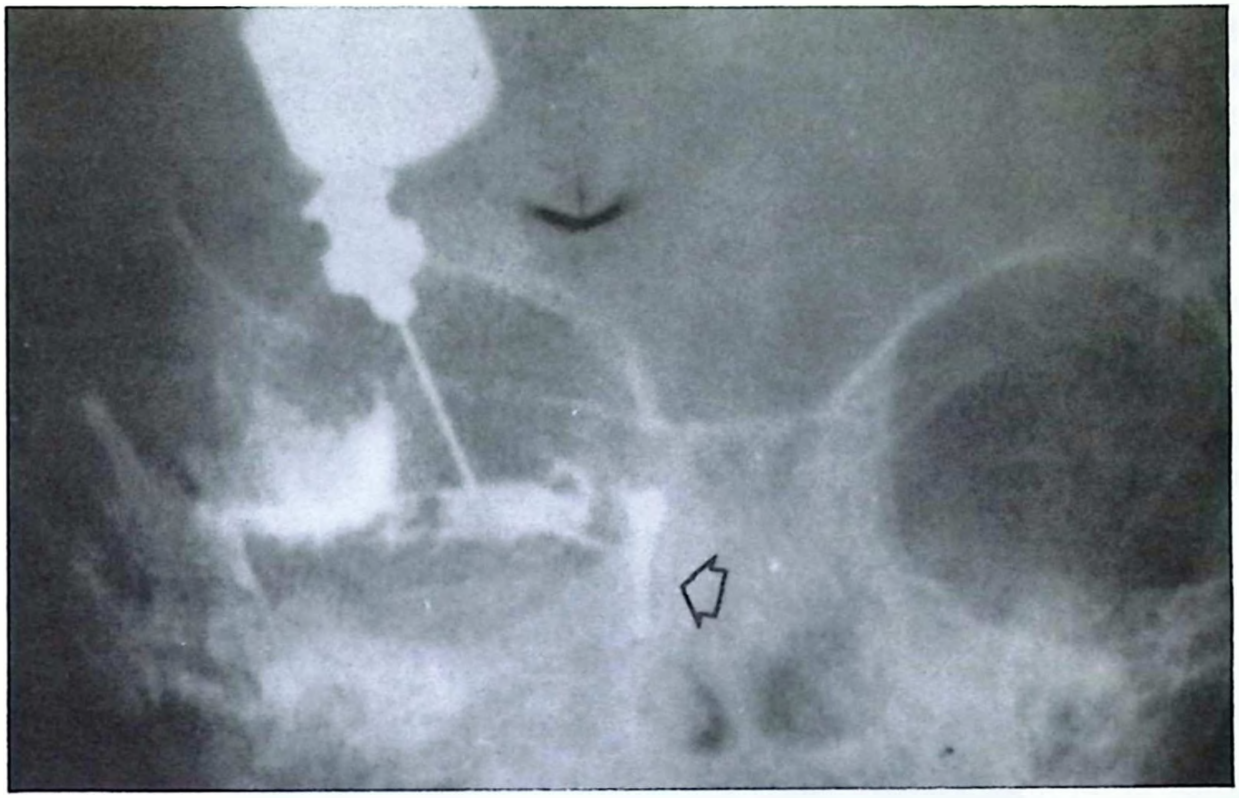

Fig. 4: Dacryocystogram before pressure irrigation. An obstructed duct is shown; the duct is straight (arrow).

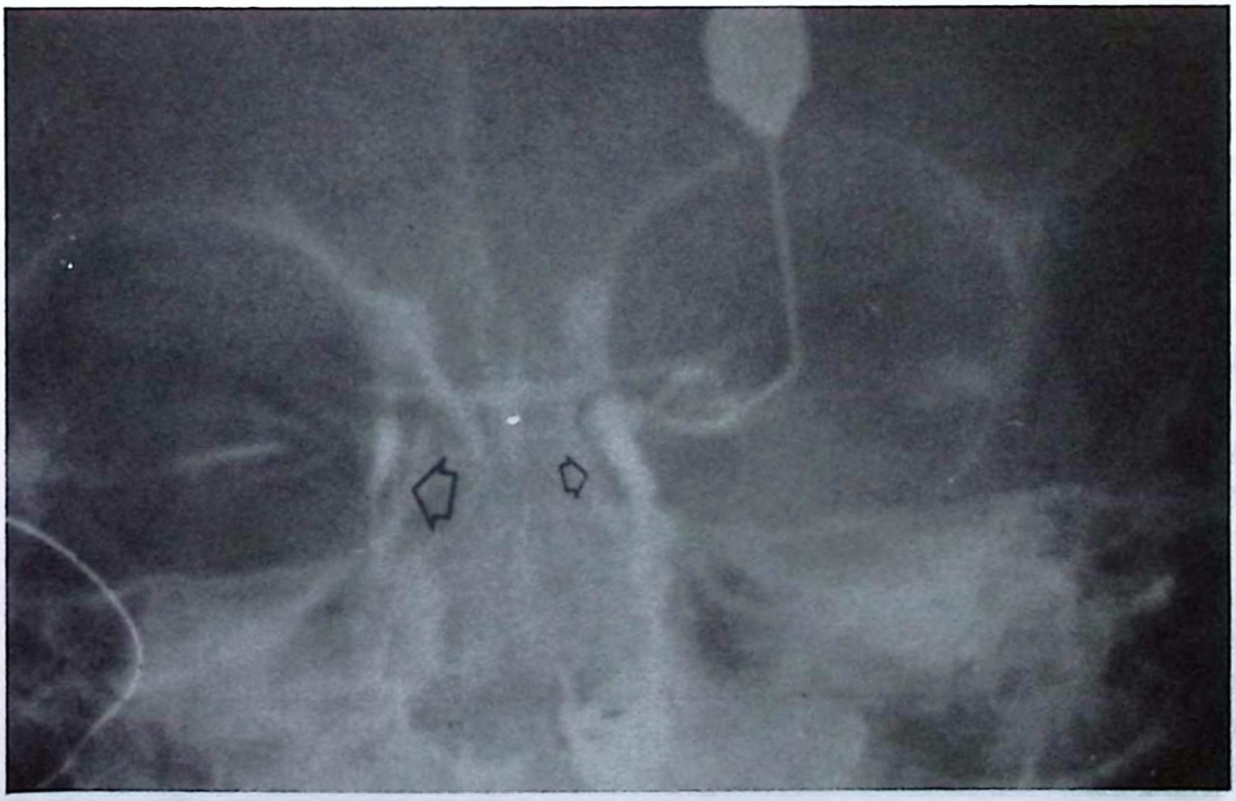

Fig. 5: Dacryocystogram after the pressure irrigation. Same patient as Fig. 4. Passage is demonstrated (large arrow). Patent nasolacrimal duct is seen on the other side (small arrow).

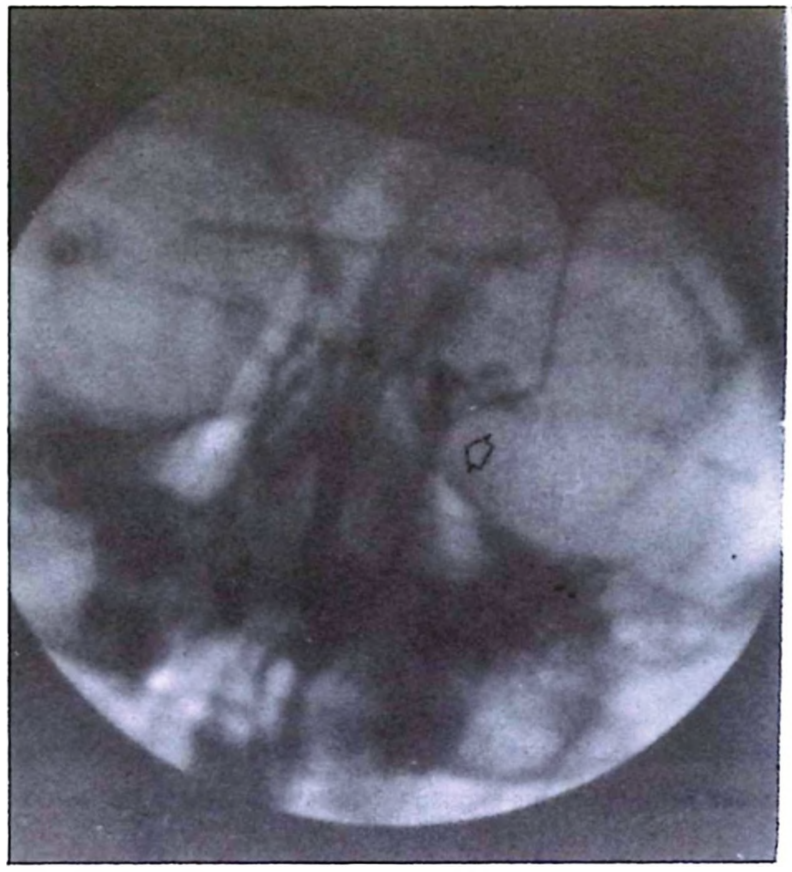

Fig. 6: Dacryocystogram after the pressure irrigation. Blockage is cleared (arrow).

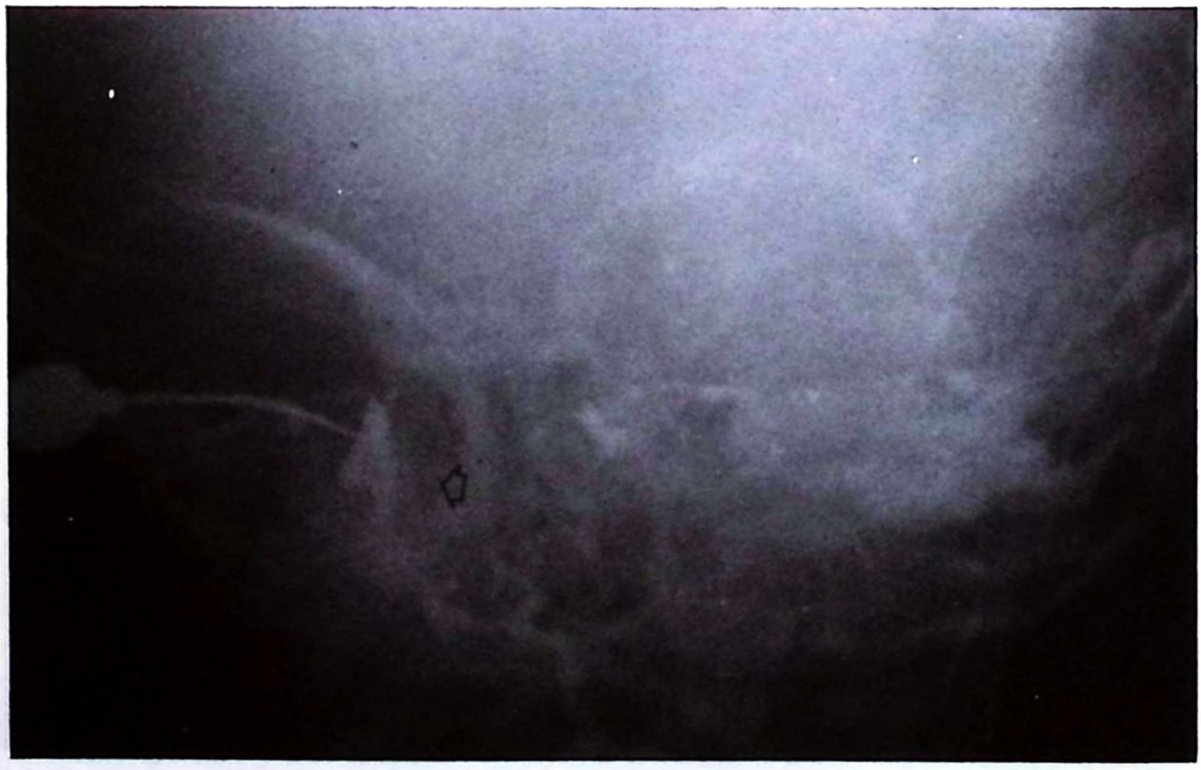

Fig. 7: Contrast filled nasolacrimal duct as seen on the fluoroscoopy screen. Blockage is cleared after probing (arrow).

The results were analyzed statistically with the chi-square test; Fisher's Exact chi-square test was used when applicable. The efficacy of four interventions (MBC, PI, PRB, INF) was related to age groups and the presenting pathology, and the correlation analysis was done. The difference between the results of various forms of treatment when correlated to age was not statistically significant ($p > 0.05$; Fig. 1).

Overall results of treatment when correlated to presenting pathology revealed that MBC carried out at the serofibrinous stage was more effective than that at the purulent stage ($x^2 = 6.825$, $p < 0.01$). When this finding was correlated to the five age groups, MBC carried out at the serofibrinous stage at 7 - 13 months was found to be more effective than that in other age groups (Fisher's Exact Chi - square test; $p = 0.0025$, $< 0.01$).

## Discussion

This study represents the results of four interventions, namely MBC, PI, PRB or INF on 149 eyes of 111 patients with CNLDO. The overall success rate was 94.6%. The age range of the patients on admission was different from that of other studies, and some of the patients were much older than in other papers addressing same problem.

All the patients received MBC as the initial treatment, since the authors of the present study believe that any initial approach should be simple, cost - effective and non - invasive for the benefit of the patient. One hundred and one systems benefitted fully from MBC alone (67.8%). Fifty - nine patients were not included in this study since they failed to come to their follow - up visits. It is highly probable that these patients benefitted from their initial treatments and neglected to come to the clinic for follow - up. This suggests that the success rate of MBC is actually higher.

Busse et al[8] evaluated NLDs in cadavers radiologically and histologically, and found that NLDs displayed great anatomical variations. They proposed that the duct followed a curved path instead of a straight one, and the success rate of probing should be lower accordingly. In an attempt to test this hypothesis, we performed DCG on all patients before and after PI. Contrary to Busse's proposal and apart from irregularities in just a few systems, we found no evidence to support this concept (Fig. 4).

Kushner[15] demonstrated that irrigation is more effective with pressure than without it. We performed PI on those whose obstruction was not cleared with MBC, and this was usually performed when the patients were suitable for general anesthesia, regardless of age. Busse et al[8] and Bahçecioğlu[16] suggested probing with Bangerter probe and irrigating the system with pressure. Although PI was suggested as the initial form of therapy in classical texts, early probing was

alternatively suggested[17]. It is interesting that very few investigators have advocated the use of PI; we wish to emphasize its importance as an effective and less invasive procedure before one attempts PRB.

Guerry and Kendig[3] suggested probing under general anesthesia. However, Jones and Wobrig[17] and Koke[18] suggested this procedure be carried out on an outpatient basis under the age of one. We performed probing under general anesthesia regardless of age since we had an experienced pediatric anesthesia staff. This way, manipulation became much easier and less risky, and the quality of diagnostic X-rays was improved. It is stated that the risk of complicated anesthesia is minimal after six months of age[19]. We did not encounter a serious complication related to anesthesia except for one patient who developed minimal respiratory distress. Probing was not performed, and she was scheduled for probing in the near future.

The initial timing of probing has been controversial. While some authors believe that conservative treatment should be carried out for up to 12 or 13 months and PRB performed thereafter[5], others suggest PRB be performed during the first few months of life. Katowitz and Welsh[20] stated that the success rate of PRB performed under the age of 13 months was 97%, rapidly falling after that age. Lemke and Della Rocca[21] give similar cure rates for PRB. Nucci et al[11] advise PRB when conservative management fails after a three-months trial. Flanagan[22] advises treating the patients conservatively for nine months and performing PRB thereafter. Petersen and Robb[23], in a study which included 65 affected eyes of 50 patients, found out that while spontaneous relief was obtained in 58 eyes with massage alone, PRB was necessary in seven, and stated that PRB be delayed until the patient is eight months old. We performed PRB when necessary on eight patients regardless of age, when previous therapeutic forms failed. However, the small number of PRB in our series is hardly enough to make any statistical analysis possible, although the results are favorable in terms of clearance of the blockage.

Robb[4] stated that the success rate was 90% after first probing and 6% after the second. We performed second probing in two systems which belonged to separate patients. Both had their initial probing elsewhere, and during the second probing, a careful intranasal examination revealed inferior turbinate impaction which was successfully infractured, leading to relief of symptoms. Various authors stated that infracturing the inferior turbinate increased the success rate[24-27].

It is interesting that in our study, despite careful pre-operative nasal examination performed usually with an experienced otorhinolaryngologist, only two patients were found to have impacted inferior turbinates over the NLD and they underwent INF with relief. This number is not sufficient to make any statistical analysis possible. However, we recommend careful nasal examination on all

patients prior to surgery, since overlooking the presence of an impacted turbinate will eventually result in failure.

We strongly recommend PRB under fluoroscopy in the management of CNLDO. With the help of this procedure, the nasolacrimal system can be visualized with contrast material, and probing performed under observation. In doing so, the location of the probe in the duct and the inferior meatus can be confirmed and misdirection problems solved, particularly in the presence of anatomic variations. In our series, an ectopic sac, which could have been probed and damaged if not realized, was visualized with fluoroscopy and the probing was discontinued.

Meticulous effort was spent to visualize the systems during probing, since we believe that following and respecting the anatomic pathway as much as possible may increase the chance for permanent relief throughout the patient's life. Reported failure of probing in the literature[17] could be due to underestimating this fact, and the success rate should be increased accordingly.

The dose of radiation received by the skull during 2.5 minutes of fluoroscopy at 90 kVp, 2 mA is estimated to be 10 rad. During each dacryocystography, the dose received by the patient is approximately 500 mrad. Doses more than 1000 rad with a minimum dose of 200 rad per day are regarded as capable of producing serious side-effects such as formation of cataract[14]. Higher doses may result in retinal damage or even optic atrophy[28,29]. Since the total dose received by our patients was much lower than the potentially hazardous doses, the radiation received by our patients is justifiable.

Eight cases were unsuccessful in our series. One of these patients had complicated anesthesia, therefore probing was not attempted and she was scheduled for another probing in the near future. One patient had an ectopic sac demonstrated by fluoroscopy and probing was not performed. One patient had abnormal lower punctum and canaliculus; although obstruction was cleared following a successful PI from the upper punctum, some complaints continued. The families of four patients did not permit probing. In one patient, a successfully probed NLD was re-obstructed due to hypertrophied nasal mucosa. This patient did not have impacted inferior turbinate over the opening of the NLD, and he was scheduled for a second probing. However, the contact was lost since he moved to another part of the country.

The main treatment regimen is designed such that except for the MBC, other treated groups actually received more than one form of therapy. For instance, the PI group had also received MBC previously; the PRB group had received MBC and PI, and so on. However, an attempt was made to correlate the efficacy of the intervention to the age groups, and it was found out that MBC seemed to be more effective than other interventions, although this finding was not statistically significant ($p > 0.05$, Fig. 1).

However, when the overall treatment was correlated to the presenting pathology, MBC was found to be more effective if performed at the serofibrinous stage, and this finding was statistically significant ($p < 0.01$, Fig. 2). When this finding was correlated to the age groups, it was found out that MBC performed at the serofibrinous stage and at 7-13 months was more effective than that performed at other ages ($p > 0.01$, Fig. 3). This emphasizes the importance of early conservative treatment while the inflammation is still at the serofibrinous stage.

In conclusion, CNLDO should be managed with an initial conservative treatment started without delay and continued for up to two months. If the blockage is not cleared at the end of this period, the patient must be referred to the operating room for PI, PRB or INF. PI should be attempted before PRB in all patients, and PRB must be performed under fluoroscopy to minimize the risks of misdirection. This enhances safety and reduces the risk to the lacrimal passages. When these crucial points are remembered, CNLDO can be managed more successfully.

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