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Comparison between nasolacrimal syringing/probing, macrodacryocystography and surgical findings in the management of epiphora

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Abstract

Aims **Macrodacryocystography (MDCG) has been shown to be highly sensitive in evaluating the lacrimal drainage system. We aimed to compare the results of syringing/probing with MDCG, and with surgical findings where available. We also aimed to determine whether MDCG is advisable in addition to syringing/probing when investigating epiphora.**

Methods **In a retrospective study, we looked at the records of 76 consecutive patients (86 eyes) presenting with epiphora over a period of 2 years (January 1993 to December 1994). All patients underwent syringing/probing and subsequent MDCG to determine the presence and level of nasolacrimal block. The results were then compared with surgical findings where available (46 eyes, 53%).**

Results **Surgical findings were predicted by MDCG in 95.5% of cases but in only 54% by probing. Probing findings agreed with MDCG in only 51% of cases. The main areas of disagreement were the presence of canalicular blocks and the presence of more than one block at different levels.**

Conclusion **A combination of syringing/probing and MDCG provides the most accurate pre-operative lacrimal assessment and should predict all the canalicular stenoses requiring intubation. In addition, MDCG can predict physiological duct blocks beyond canalicular blocks and thus alter surgical management.**

Key words Canalicular block, Dacryocystorhinostomy, Epiphora, Nasolacrimal intubation, Nasolacrimal syringing, Macrodacryocystography

Epiphora can be due to excessive production of tears (lacrimation) or insufficiency of the lacrimal drainage system; this insufficiency can be caused either by the presence of an anatomical obstruction in the membranous tear passages (obstructive epiphora) or by an improper functioning of the lacrimal pump mechanism which, despite patent tear passages, fails to transmit tears from the eye to the nose (functional block).

With the introduction of new lacrimal surgical techniques, for example silicone intubation and endonasal surgery, it is more possible to tailor surgical intervention to the specific level and type of lacrimal blockage. It has thus become more important to predict the presence and level of blockages. Lacrimal investigations have also become more sophisticated with the advent of technetium scanning and CT macrodacryocystography in addition to the traditional macrodacryocystography (MDCG).

Studies comparing MDCG with surgical findings[1] and scintigraphy[2] have shown that MDCG can predict 98% of blocks in the common canaliculus, while outside this region the accuracy of diagnosis was 100%. We present here a study comparing MDCG with syringing/probing and surgical findings where available to determine which is the most accurate determinant of the presence and level of nasolacrimal blockage.

Methods

In a retrospective study, we looked at the records of 86 consecutive patients (98 nasolacrimal systems) undergoing MDCG for epiphora over a period of 2½ years (January 1993 to May 1995), including tertiary referrals

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presenting to a teaching hospital with a lacrimal specialist. All patients underwent either syringing by the nurses and general ophthalmologists or syringing/probing by the lacrimal team at their first clinic visit to determine the presence and level of nasolacrimal block. The findings were noted in the clinical records. Patients with suspected nasolacrimal blockage subsequently underwent MDCG within 10–60 days of their initial presentation (average 35 days). The results of syringing/probing and MDCG were then compared with documented surgical findings where available (51 eyes, 52%). We also compared the results of syringing performed by the nurses and general ophthalmologists and syringing/probing performed by the lacrimal team with MDCG for the 98 systems studied.

Technique of syringing/probing

Diagnostic syringing was performed by consultant ophthalmologists, residents and nurses alike. In addition, diagnostic probing was performed by the lacrimal team using the following technique. After instilling amethocaine into the conjunctival sac, the puncta were dilated, if necessary, with a Nettleship punctal dilator. Syringing was performed by introducing the tip of a lacrimal cannula through the punctum at right angles to the lid margin. Having drawn the lid laterally with a finger to straighten out the canaliculus, the syringe was rotated laterally and its tip advanced into the canaliculus. The passages were gently irrigated with saline and the ease with which saline flowed through the system was noted; any regurgitation of either clear fluid or mucus from either punctum was also noted.

Diagnostic probing was performed with a 00 Bowman's probe introduced through the punctum in a similar manner and advanced into the system until a hard or a soft stop was obtained. When a soft stop was felt, the distance traversed by the probe from the punctum until it came to a stop was measured, which gave the length of the patent system and hence the location of the block. Findings were noted diagrammatically in the patient's clinical records.

Technique of macrodacryocystography

A modification of the method described by Lloyd *et al.*[3] was used routinely for MDCG. Amethocaine was instilled into the conjunctival sac and the inferior punctum dilated with a Nettleship punctum dilator and catheterised with either soft polyethylene tubing or a blunt metal cannula. A control radiograph was taken prior to the injection of contrast medium to see any bony deformity of the orbit or nasal bones. Urograffin (a non-viscous, water-soluble contrast medium) at a concentration of 300 mg iodine/ml was used. The injection was made first in a large volume, aiming to fill the lacrimal duct system and flush out any retained secretions. Thereafter, a slow, continuous injection was maintained whilst obtaining radiographs of the filled lacrimal system. A series of at least two radiographs was taken during the injection of contrast medium. After sitting the patient erect for 5 min, the final radiograph was taken to identify any retained contrast medium in the system. Subtraction technique was not used. Bilateral examinations were performed only for bilateral symptoms. All procedures were performed and reported by a consultant radiologist.

Surgical findings

Surgical findings were obtained from the patient's operative records. Those in which intraoperative probing findings were mentioned were regarded as fully documented, but those where either the probing findings or the level of block was not mentioned were considered as non-documented.

Results

Of the 86 patients included in the study, 12 had bilateral epiphora and underwent bilateral examination, giving a total of 98 nasolacrimal systems studied. Fully documented surgical findings were available for only 51 nasolacrimal systems. Intraoperative probing findings were not recorded in 29 patients/duct systems operated on. Of the remaining 28 patients, 12 were still awaiting surgery while 6 refused surgery.

The comparison between syringing/probing, MDCG and surgical findings for 51 nasolacrimal systems is shown in Table 1. Obstruction of superior/inferior canaliculi was demonstrated surgically in 5 lacrimal systems; the obstructions were accurately predicted by syringing/probing in 3 cases (60%) and by MDCG in 5 cases (100%). A common canalicular block (partial/complete) was found intraoperatively in 33 nasolacrimal

Table 1. *Breakdown of the level of blocks confirmed intraoperatively by MDCG*

Site	Block found at surgery	Block predicted by syringing/probing	Block predicted by MDCG
Superior/inferior canalicular	5	3 (60%)	5 (100%)
Common canalicular	33	17 (51%)	31 (93.9%)
Nasolacrimal duct only	8	5 (60%)	8 (100%)
Congenital anomalies	2	0	2 (100%)
Mass in sac area	3	0	3 (100%)
Multiple blocks	11	0	11 (100%)
Total no.	51	25 (50.9%)	49 (96%)

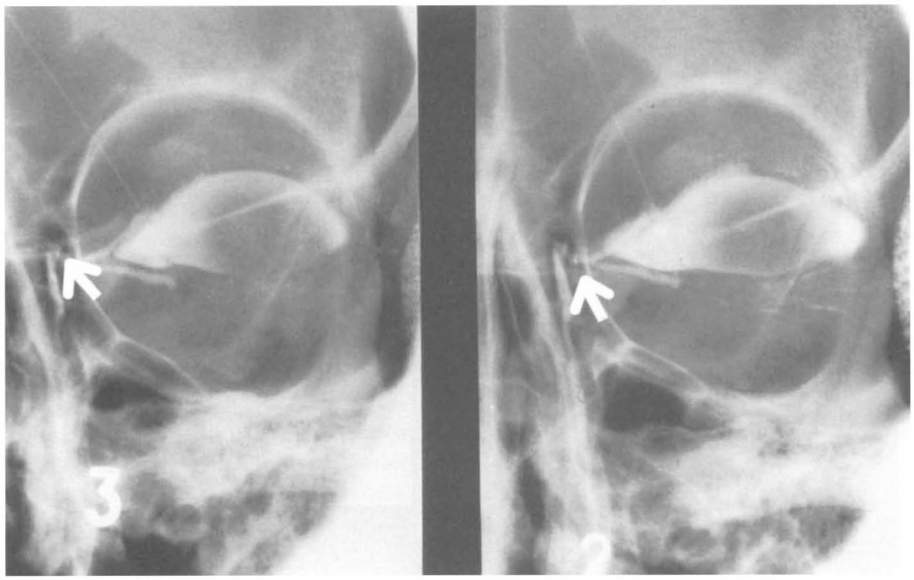

Fig. 1. *A left dacryocystogram showing a partial common canalicular block (arrow).*

systems and was predicted by syringing/probing in 17 cases (51%) and by MDCG in 31 cases (93.9%). The main areas of disagreement were over the detection of partial common canalicular block and medial blocks that were demonstrated by MDCG (Fig. 1) but not by syringing/probing. There were 2 common canalicular blocks described as lateral by MDCG but found to be medial at surgery.

Blockage of the nasolacrimal duct only was detected accurately by syringing/probing in 5 lacrimal systems (60%) and by MDCG in 8 lacrimal systems (100%). Multiple blocks, i.e. canalicular as well as the nasolacrimal duct, that were missed by syringing/probing were picked up by MDCG in 11 nasolacrimal systems (100%).

Congenital anomalies of the nasolacrimal system were detected by MDCG in 2 patients. In one, there was unilateral reduplication of the whole canalicular system (Fig. 2). In the other patient, there were diverticuli of the canaliculi; the complete anatomical extent of the congenital anomaly could not be detected by syringing/probing alone.

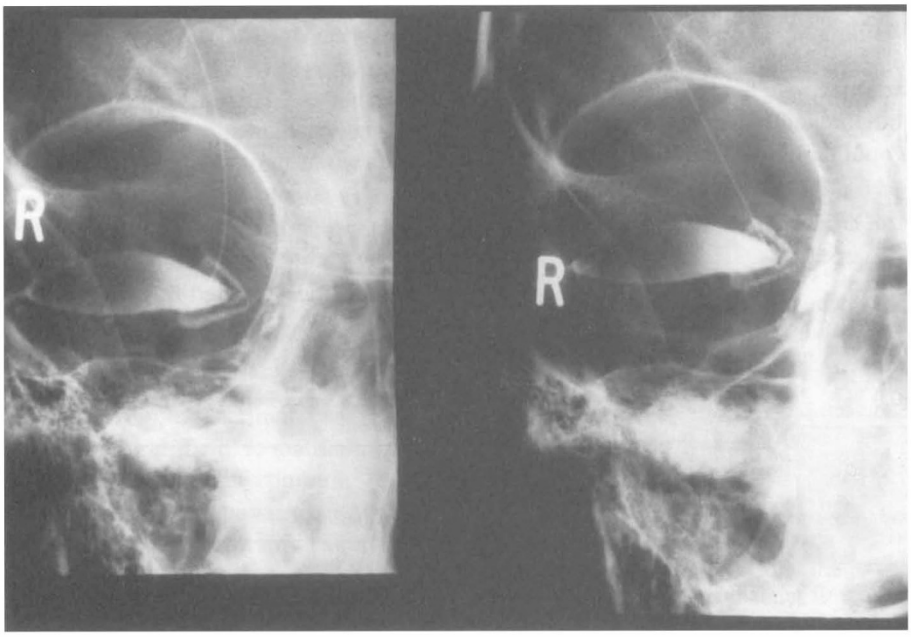

Fig. 2. *A right dacryocystogram showing congenital reduplication of the canalicular system.*

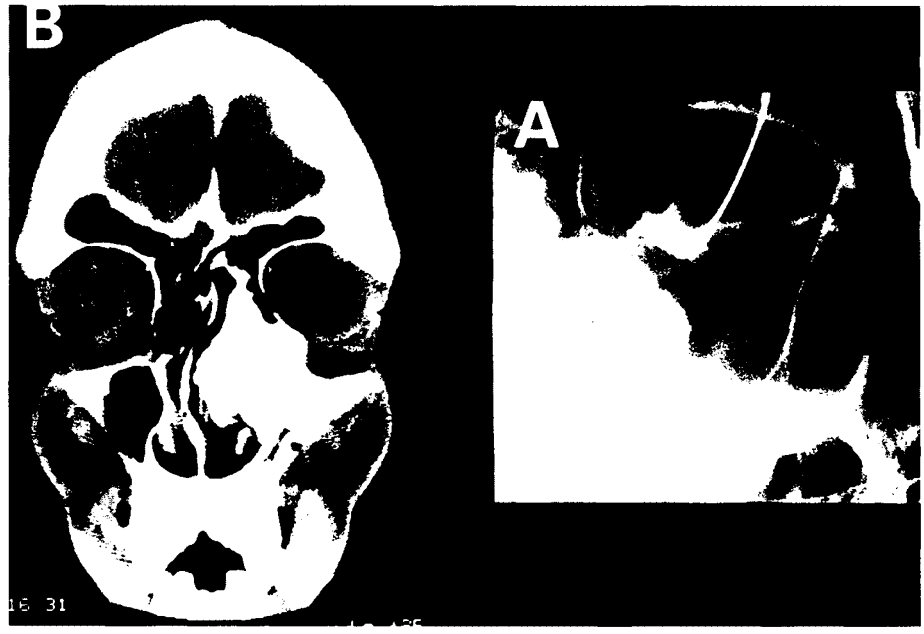

Fig. 3. *(A) A left dacryocystogram showing a large mass along the medial orbital wall displacing the nasolacrimal duct and resulting in a secondary mucocoele and dilatation of the canaliculi. (B) A CT dacryocystogram confirming the mass as a tumour arising from the ethmoid sinuses.*

Masses in the lacrimal sac area were detected by MDCG in 3 systems. In 2 cases there was an inflammatory granuloma of the sac; in the third patient there was a large osteoma arising from the ethmoid sinuses compressing the duct and resulting in a secondary mucocoele. A CT MDCG was performed to define the extent of the tumour (Fig. 3). The presence and the extent of tumour and the involvement of the lacrimal drainage system were not detected by syringing/probing alone.

The overall sensitivity of MDCG in the diagnosis of nasolacrimal blocks was 96% compared with 50.9% for syringing/probing (McNemar's test $\chi^2 = 19.6$, $p < 0.001$) (Fig. 4).

We also compared the results of syringing performed by nurses and ophthalmologists with syringing/probing performed by the ophthalmologists of the lacrimal team (Table 2). This showed that when syringing alone was performed, it correlated with MDCG in 36% of cases, while the addition of diagnostic probing improved the correlation to 51%. There was no difference between syringing performed by ophthalmologists and that performed by nurses.

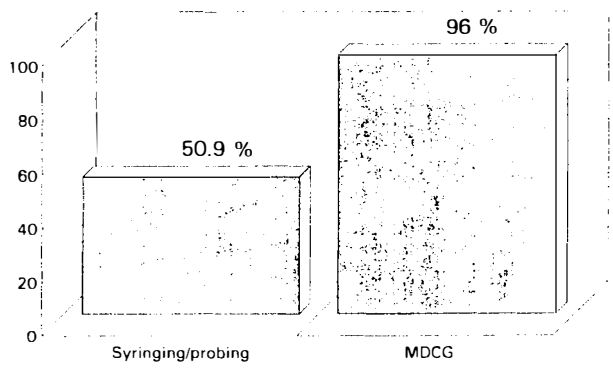

Fig. 4. *The overall sensitivity of dacryocystography in the diagnosis of nasolacrimal blocks (n = 51).*

Discussion

Several techniques are used by ophthalmologists to confirm the presence, degree and site of obstruction in the lacrimal drainage system. Such tests include the fluorescein dye disappearance test,[4] fluorescein appearance test,[5] saccharin test,[6] Jones 1&2 tests,[7] syringing and diagnostic probing,[8] scintigraphy,[9] dacryocystography and CT dacryocystography.[10] These tests vary in the extent to which they test the lacrimal drainage system anatomically or physiologically. Syringing is the most commonly used clinical investigation. Hanna *et al.*[9] have shown that about 65% of abnormalities detected by scintigraphy were missed by

Table 2. *Comparison between syringing/probing and MDCG for the 98 systems*

Performed by:	No.	Agreed with MDCG	Correlation with MDCG (%)
Syringing only			
Nurses	18	6	33
Ophthalmologists	23	12	36
Syringing/probing			
Lacrimal team	47	24	51

syringing. Rose and Clayton[2] reported that the anatomical detail on scintigraphy was inadequate to differentiate between canalicular and sac blocks.

The conventional method of dacryocystography was introduced in 1909 by Ewing[11] and was superseded by an intubation technique introduced by Barrie Jones in 1959. Campbell,[12] in 1964, introduced MDCG, in which the radiographic image was geometrically enlarged. He claimed that MDCG is valuable to the surgeon for the following purposes: (1) to locate the level of obstruction, (2) to show the state of completeness/incompleteness of obstruction and, (3) to provide knowledge that is helpful in anticipating any surgical difficulties. Intubation MDCG was described by Lloyd *et al.*[3] in 1972 to produce better contrast filling of the canaliculi. Two years later Lloyd[13] introduced subtraction MDCG for better visualisation of the common canaliculus, which is the second most common site of obstruction, the nasolacrimal duct being the commonest (70% according to Rycroft[14]).

Approximately one-third of dacryocystorhinostomies that fail to relieve epiphora are due to non-recognition of a pre-existing common canalicular block.[10] In our study, 31 (93.9%) common canalicular blocks were diagnosed pre-operatively by MDCG, with an overall accuracy of localisation of 96%. This is similar to the findings of the study by Keast-Butler *et al.*[1] who diagnosed common canalicular block accurately by MDCG in 93% of cases. In our study, there was an inaccurate localisation of a lateral block in the common canaliculus in 2 cases, while at surgery the block was found to be a membranous obstruction in the medial end of the canaliculus in the sac wall. Two possible reasons for this inaccuracy have been suggested by Keast-Butler *et al.*[1] First, reflux of contrast medium into the upper canaliculus from a catheterised inferior canaliculus can fail to delineate the most distal (medial) part of an obstructed common canaliculus. Second, small adhesions may prevent the passage of contrast medium through the common canaliculus but are easily broken down by probing at surgery.

The pre-operative diagnosis of medial versus lateral block of the canalicular system is important in deciding the surgical approach. A medial common canalicular block is usually in the form of a thin membrane caused by inflammation within the sac and needs excision from within the sac leaving the system intubated for several months. However, a lateral block with 8–10 mm of a patent canaliculus requires a canaliculo-dacryocystorhinostomy in which dissection of the canaliculi and bypass of the stenosed segment is done before mobilising the sac from the lacrimal fossa. Once the sac is mobilised, it is more difficult to maintain gentle stretch on the structures leading to the common canaliculus. Mannor and Millman[15] have suggested the presence of canalicular block as a contraindication to endonasal surgery; they have shown that endoscopic technique was more successful with normal or enlarged sacs ($p = 0.049$), thus suggesting the importance of exact localisation of the block and anatomical outline of the system.

In this study we found that MDCG is very sensitive in picking up partial common canalicular blocks which, in the absence of a more distal block, can be treated by silicone intubation. MDCG elegantly outlines congenital anomalies of the nasolacrimal system and helps the surgeon to decide the correct surgical approach. MDCG combined with CT can be of great value in outlining the extent of tumour involvement around the nasolacrimal drainage area.

Possible biases and sources of errors

We think the possible sources of biases and errors in this study are as follows:

1. The MDCG reports were potentially biased by information on the MDCG request forms regarding the possible level of block detected by syringing/probing.
2. The surgeon's findings were potentially biased by the syringing/probing and MDCG findings.
3. Probing may alter a partial or complete canalicular block and affect the result of MDCG, possibly by breaking tiny adhesions in the system, but we found that the correlation with MDCG was highest where probing was performed.
4. Probing, if not performed correctly, produces canalicular damage; for example, it may create a false passage, but this will be reflected by a soft stop.

In conclusion, MDCG provides excellent anatomical detail of the nasolacrimal system, particularly of the canaliculi, and accurately predicts canalicular stenosis, multiple blocks, congenital anomalies and masses in and around the system. In addition, it may predict physiological duct block beyond the canalicular block and thus alter surgical management. Syringing/probing alone is inadequate as it misses a proportion of these findings. We recommend all patients wanting surgery for epiphora in the absence of external eye disease should have a preliminary MDCG; if this shows a patent system, then one should proceed to scintigraphy.

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