Solutions for the daily practice!

This companion title to the best-selling Teaching Atlas of Interventional Radiology: Diagnostic and Therapeutic Angiography covers the latest interventional radiology techniques used to treat non-vascular diseases.

The authors’ discussion of the critical aspects of the disease process and differential diagnoses will teach you how to quickly recognize the presentation of diseases and disorders as well as how to determine the best method of treatment. This atlas guides you through the stages of management, from initial diagnosis to treatment, with thorough descriptions of procedures including percutaneous biopsy, biliary intervention, abscess drainage, nephrostomy and genitourinary tract intervention.

Highlights:
• Full coverage of procedures for the neck and thorax; the abdomen, including gastrointestinal system, liver, biliary system, and pancreas; the reproductive and urinary systems
• "Pearls" and "pitfalls" help you understand key points and avoid errors
• A step-by-step approach to diagnosis and easy-to-follow descriptions of procedures
• Selected readings at the end of each chapter for additional study
• More than 300 illustrations demonstrating key concepts

Here is the essential guide for interventional radiologists, residents and other specialists seeking to improve their techniques in managing non-vascular disorders and problems that arise in the everyday practice.

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Also available from Thieme Medical Publishers:
Teaching Atlas of Interventional Radiology: Diagnostic and Therapeutic Angiography
Saadoon Kadir, editor
Teaching Atlas of Interventional Radiology
Non-Vascular Interventional Procedures
Teaching Atlas of Interventional Radiology
Non-Vascular Interventional Procedures

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PREFACE

"For every disease there is a cure. . . ."
—Hadith

This second volume of the Teaching Atlas of Interventional Radiology discusses non-vascular diseases. The format of the previous volume, Diagnostic and Therapeutic Angiography, has been retained to provide practical information and solutions to problems arising in everyday practice. This format is being adapted increasingly because of its usefulness for teaching purposes. The cases selected for this volume represent situations that can be expected in a busy interventional practice. There is emphasis on the clinical aspects of the diseases and treatment options as well as technical aspects of the therapeutic procedures. It is increasingly necessary, that the interventional radiologists also assume the role of a clinician.

This volume of the Teaching Atlas of Interventional Radiology is intended for physicians in training and those in clinical practice. As with the previous book, it is not intended to provide comprehensive coverage of the field but covers a range of diseases seen in a busy clinical practice.

I wish to express my sincere appreciation to the section editors and the authors for sharing their experiences, for their patience and help in bringing this project to completion. The completion of this book would have been difficult without the support from my family, in particular, from my best friend and wife, Salma.

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SECTION I

Neck and Thorax
CHAPTER 1 Nasolacrimal Duct Strictures
Joachim Berkefeld and Marc Lüchtenberg

Clinical Presentation
A 29-year-old woman presented with epiphora of her left eye necessitating
dabbing of the tears more than 10 times a day. Epiphora, painful swelling
in the left lacrimal sac region, and purulent discharge from the canaliculi
had started 7 months earlier after an upper respiratory tract infection.
Acute dacryocystitis was diagnosed and she was treated with antibiotic
and decongestant eye drops as well as irrigation. The symptoms of acute
inflammation resolved but epiphora persisted, not responding to the
conservative treatment.

Radiological Studies
The lower lacrimal punctum and canaliculus were intubated with the plastic sheath of a 24 gauge
catheter needle. Distension dacryocystography with digital subtraction imaging using constant
contrast injection revealed complete obstruction of the distal nasolacrimal duct and a visible stump
of the duct below the widened lacrimal sac. The contours of the sac and the ductal lumen were
smooth, without filling defects or deformities. There were no canalicular or lacrimal sac stenoses.
The dacryocystograms showed no contrast passage into the inferior nasal meatus but there was reflux
through the canaliculi (Fig. 1-1).

Figure 1-1 Distension dacryocystogram shows complete obstruction of the distal left nasolacrimal duct
(arrow) and dilation of the lacrimal sac.
Diagnosis
Obstruction of nasolacrimal duct above the level of Hasner's valve

Treatment Options
The acute dacryocystitis was treated successfully by antibiotics, decongestants, and irrigation. However, this conservative therapy was not successful for the epiphora. Persistent symptoms together with the dacryocystographic finding of complete nasolacrimal duct obstruction established the indication for recanalization of the ductal system. Treatment options included an open or endoscopic surgical procedure or balloon dilatation. Open or endoscopic surgical dacryocystorhinostomy has high technical success and post-procedure patency rates but requires general anesthesia. The surgical procedure is associated with a risk of eyelid deformity secondary to scarring. Our experience with balloon dacryocystoplasty suggested that recanalization of focal occlusions of the distal nasolacrimal duct were technically feasible with a reasonable long-term outcome. Therefore, the less invasive balloon dilatation was chosen as the first treatment option.

Treatment
Surface anesthesia (Proxymetacain eye drops) was applied to the left eyelid and also injected through the intubated canaliculus. The nasal mucosa was anesthetized with lidocaine spray. The upper punctum was dilated with a conical dilator and the plastic sheath of a 22 gauge catheter needle (Surflo, Terumo) was inserted into the opening. A 0.014 in. steerable guide wire with hydrophilic coating and a flexible, shapeable tip (Transend X, Target-Boston-Scientific, Freemont, CA) was inserted (alternatively, a stiffer 0.014 in. extra-support cardiac wire Choice, Boston-Scientific, Watertown, MA) could be used). The wire was angled upward together with the cannula and pushed forward into the stump of the nasolacrimal duct. The cannula was advanced over the wire as far as possible. Under

Figure 1-2 (A) Image shows the angioplasty balloon inflated in the obstructed duct segment. (B) Postdilatation dacryocystogram shows a recanalized nasolacrimal duct. (C) After removal of the guide wire, the duct lumen is widely patent and there is free flow of contrast material into the inferior nasal meatus.
the guidance of the cannula, the hydrophilic wire easily passed the initial portion of the occluded duct. Despite a moderate amount of resistance at Hasner’s valve, the guide wire could be advanced into the inferior nasal meatus. The curved tip was then manipulated out through the nasal cavity using lateral fluoroscopy. A 3 mm × 2 cm small-vessel angioplasty balloon catheter (Crosssail, Guidant, Temecula, CA) was inserted via the nasal cavity and inflated up to 8 atm. Repeated dacryocystograms after balloon dilatation showed recanalization of the occluded duct segment and normal contrast flow into the inferior nasal meatus (Fig 1-2). Clinically, there was complete resolution of the epiphora immediately after the dacryocystoplasty. No recurrence has been observed during the follow-up period of 6 months.

Discussion

Epiphora, persistent tearing of the eye, is due to an imbalance between the production and drainage of the lacrimal fluid. It is a frequent symptom in patients seen in an ophthalmology practice. Lacrimal duct obstruction is a major cause of epiphora. Obstruction develops frequently as sequelae to acute or chronic dacryocystitis. Other causes include posttraumatic (after facial fractures), maxillary sinus surgery, and congenital stenoses.

Acute inflammatory changes (swelling, skin discoloration, and purulent discharge) frequently resolve with conservative therapy (antibiotics, decongestants, and irrigation). Emergency surgical drainage of an empyema is necessary only occasionally. Chronic dacryocystitis is associated with thickening of mucosal folds in the lacrimal sac or the nasolacrimal duct. Obstructions develop mainly in areas of physiological narrowing, namely, at the junction of the lacrimal sac and nasolacrimal duct (valve of Krause) or at the outlet of the nasolacrimal duct (valve of Hasner). Retention of viscous mucus or calculus formation (dacryocystolithiasis) may further impede drainage of lacrimal fluid.

A dacryocystogram is necessary to assess the degree and the location of ductal obstruction in patients who have failed conservative treatment of epiphora. Our experience and data from the literature indicate that fluoroscopically guided balloon dacryocystoplasty is a viable alternative to operative treatment, especially in cases fulfilling the criteria listed in Table 1-1. A technical success rate of 90% and long-term improvement in 70 to 80% can be expected, if these criteria are used for patient selection. Current data suggest that balloon dacryocystoplasty is an alternative to open or endonasal surgery in 30 to 50% of the patients presenting with epiphora.

As an alternative to the technique described (i.e., the use of steerable micro guide wires for recanalization), some authors have described the use of 0.021 in. hydrophilic-coated guide wires or special ball-tip wires. Both of these seem to be more traumatic to the ductal structures.

Table 1-1 Indications and Contraindications for Dacryocystoplasty

<table>
<thead>
<tr>
<th>Indications</th>
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<td>Partial obstruction of the nasolacrimal duct or the lower portion of the lacrimal sac</td>
<td>Active dacryocystitis</td>
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<tr>
<td>Complete obstruction of the distal nasolacrimal duct with a visible stump</td>
<td>Posttraumatic stenoses (occurring after facial bone fractures)</td>
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<td>Adult age of the patient</td>
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<tr>
<td>Absence of active inflammation</td>
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<td>Absence of findings indicating posttraumatic obstruction</td>
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<td>Absence of filling defects on dacryocystography that would indicate the presence of dacryocystolithiasis</td>
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<td>Absence of high-grade or diffuse obstruction in the canaliculi or lacrimal sac</td>
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Complete obstruction of the entire nasolacrimal duct can also be recanalized if the lesion allows passage of a guide wire. However, long-term follow-up of such cases showed recurrence of clinical symptoms in excess of 50%. The use of metallic or plastic nasolacrimal duct stents can improve technical success rates, but the long-term outcome is limited because of stent obstruction due to incrustation or overgrowth of granulation tissue.

Calculi have been removed in an occasional case by forceful irrigation after dilatation of the lumen. Dilatation of canalicular stenoses is also technically feasible, but the long-term results are unknown. Therefore, widespread use of these techniques is presently not recommended.

Endoscopically guided mechanical or laser-assisted dacryocystoplasty may be complementary to or an alternative to the radiological technique and has the advantage of directly visualizing dacryoliths or lesions of the ductal wall. Technical and clinical success rates appear to be similar to those of the radiological technique. The main advantage of the interventional radiological approach is that the level of invasiveness is relatively low. The procedure is well tolerated by most of the patients and can be performed on an outpatient basis using surface anesthesia.

**PEARLS AND PITFALLS**

- Epiphora due to obstruction of the lacrimal draining system is frequently caused by sequelae of acute or chronic dacryocystitis.
- Balloon dacryocystoplasty is a minimally invasive alternative to operative dacryocystorhinostomy in patients who have failed conservative management.
- High technical and clinical success rates can be expected in circumscribed stenoses or distal occlusions of the nasolacrimal duct.
- Interventional treatment is contraindicated in the presence of active dacryocystitis or bony narrowings. The application of the interventional radiological approach for occlusions of the entire nasolacrimal duct, canalicular stenoses, and dacryolithiasis is of questionable benefit.

**Further Reading**


CHAPTER 2 Percutaneous Parathyroid Ablation
Shozo Yano and Masafumi Fukagawa

Clinical Presentation
A 51-year-old man who had been on maintenance hemodialysis for 17 years was referred for the evaluation of hyperparathyroidism. Despite medical treatment that included phosphate binders and oral active vitamin D sterols, serum levels of intact parathyroid hormone (PTH) remained between 600 and 800 pg/mL with evidence for high turnover bone disease (i.e., elevated serum alkaline phosphatase and skeletal changes on bone radiographs). Intravenous vitamin D therapy (calcitriol 1 μg, three times per week at the end of each hemodialysis treatment) not only failed to suppress PTH secretion but led to marked hypercalcemia and hyperphosphatemia (calcium corrected for albumin 11.0 mg/dL, phosphate 6.0 mg/dL).

Radiological Studies
Ultrasonography demonstrated marked enlargement of the left lower parathyroid gland (Fig. 2-1A). A round, encapsulated mass that demonstrated increased vascularity was present within the gland (Fig. 2-1B), suggesting the presence of a nodule. The left upper and right lower parathyroid glands (not shown) were also mildly enlarged.

Diagnosis
Parathyroid hyperplasia (nodular) with secondary hyperparathyroidism due to chronic renal failure