

# NATIONAL INSTITUTE FOR HEALTH AND CLINICAL EXCELLENCE

## INTERVENTIONAL PROCEDURES PROGRAMME

### Interventional procedure overview of therapeutic sialendoscopy

The salivary glands are located around the mouth and the throat. These glands may at times be blocked, usually because of stones. Sialendoscopy involves the use of a flexible tube (endoscope) to enter a salivary gland and to visualise and remove the stone.

#### Introduction

This overview has been prepared to assist members of the Interventional Procedures Advisory Committee (IPAC) in making recommendations about the safety and efficacy of an interventional procedure. It is based on a rapid review of the medical literature and specialist opinion. It should not be regarded as a definitive assessment of the procedure.

#### Date prepared

This overview was prepared in November 2006

#### Procedure name

Interventional sialendoscopy

Interventional sialendoscopy for salivary ductal disorders

#### Specialty societies

British Association of Oral and Maxillofacial Surgeons

British Association of Otorhinolaryngologists, Head and Neck Surgeons

#### Description

##### *Indications*

Suspected salivary gland obstruction.

There are three main pairs of salivary glands in the mouth. The largest pair is the parotid glands which are located just behind the angle of the jaw, below and in front of the ears. Two smaller pairs, the sublingual and submandibular glands, are found in the floor of the mouth. In addition to these glands, many tiny salivary glands are distributed throughout the mouth. All of the glands secrete saliva into the mouth.

Most salivary duct disorders are obstructive, most commonly sialolithiasis (stones in the salivary glands) and, more rarely, tumours. Other salivary duct disorders include infection, injury or malfunction due to certain systemic disorders.

Symptoms of salivary gland obstruction are varied, depending on the cause, and include swelling of the face or neck, swelling in front of the ears, pain in the face or mouth pain, decreased ability to open the mouth and a dry mouth.

### ***Current treatment and alternatives***

Treatment of salivary gland obstruction depends on the underlying cause and location. Medical therapy may be indicated where the cause of the disorder is due to systemic disease or infection. For most benign ductal disorders such as calculus disease, treatment includes intraoral excision of the stone if easily accessible. Minimally invasive procedures such as interventional sialography and extracorporeal or endoscopic lithotripsy may also be an option. More invasive surgical procedures such as sialadenectomy (removal of the gland) may be considered for large or less accessible stones and also for salivary tumours.

### ***What the procedure involves***

This procedure can be used both for diagnosis and treatment of benign salivary gland obstruction.

The procedure is typically performed under local anaesthesia with the patient sitting or partially recumbent. Progressive dilatation of the salivary duct is then performed until the opening is large enough to allow the introduction of an endoscope. The endoscope is introduced and advanced into the duct. The duct is irrigated initially with a local anaesthetic solution and then with saline as the scope is passed through the ductal system. Different instruments (such as baskets) can then be introduced through a working channel that is built into the endoscope allowing treatment of the pathology (such as removal of the stone). The endoscope is then introduced one last time to rinse the duct.

### ***Efficacy***

This evidence on efficacy is based on five case series studies. Four of those studies reported on the use of sialendoscopy as a diagnostic and interventional technique for disorders of the salivary ducts and one study only evaluated sialendoscopy as a diagnostic procedure.

The specialist advisers listed the key efficacy outcomes as establishment of diagnosis, relief of symptoms, removal of obstruction and restoration of gland function.

In the studies the procedural success rate (resolution of obstruction) ranged from 82% (90/110)<sup>3</sup> to 87% (47/54)<sup>4</sup>.

In a study of 72 patients, 8% (6/72) had clinical or subjective problems which did not improve after the procedure and required removal of the gland. In another study of 129 patients, 110 of whom underwent interventional sialendoscopy, sialendoscopy treatment in 18% (20/110) of patients was considered a failure, with five patients requiring gland resection.

Recurrence of obstructive symptoms were reported in two to the studies with rates of 2% (4/236)<sup>1</sup> and 5% (3/55)<sup>5</sup> respectively. All recurrences occurred between 15 and 24 months after the procedure.

The specialist advisers did not considered there to be any uncertainties about this procedure. One specialist adviser noted that high success rates are reported in the published literature.

## **Safety**

The evidence on safety is based on five studies.

Few complications were reported in the reviewed literature. The most common complication reported by patients following the procedure was temporary swelling of the gland. In one study of 129 patients,<sup>3</sup> ductal wall perforation occurred in 11 patients (9%), with two of these patients requiring hospitalisation and one patient undergoing gland resection. Three other studies reported cases of perforation with an incidence of 3/55<sup>5</sup>, 1/103<sup>6</sup>, 1/236<sup>1</sup> respectively. One patient (1/236)<sup>1</sup> suffered from lingual nerve paraesthesia caused by the perforation. Ductal strictures were also reported in seven patients in a case series study of 236 patients<sup>1</sup>. Five of these underwent successful dilatation with two requiring further surgery. Other complications included wire basket blockages and infection.

The specialist advisers listed the potential complications as infection, perforation of the duct, ranula formation, lingual nerve injury and breakage of retrieval baskets.

## **Literature review**

### ***Rapid review of literature***

The medical literature was searched to identify studies and reviews relevant to interventional sialendoscopy. Searches were conducted via the following databases, on 14th November 2006; Medline, PreMedline, EMBASE, Cochrane Library and other databases. Trial registries and the Internet were

also searched. No language restriction was applied to the searches. (See Appendix C for details of search strategy.)

The following selection criteria (Table 1) were applied to the abstracts identified by the literature search. Where these criteria could not be determined from the abstracts the full paper was retrieved.

**Table 1 Inclusion criteria for identification of relevant studies**

Characteristic	Criteria
Publication type	Clinical studies were included. Emphasis was placed on identifying good quality studies. Abstracts were excluded where no clinical outcomes were reported, or where the paper was a review, editorial, laboratory or animal study. Conference abstracts were also excluded because of the difficulty of appraising methodology.
Patient	Patients with salivary ductal disorders
Intervention/test	Therapeutic sialendoscopy (articles that solely reported on the use of this procedure as a diagnostic tool were excluded).
Outcome	Articles were retrieved if the abstract contained information relevant to the safety and/or efficacy.
Language	Non-English-language articles were excluded unless they were thought to add substantively to the English-language evidence base.

### ***List of studies included in the overview***

This overview is based on five case series studies. Four of those studies reported on the use of sialendoscopy as a diagnostic and interventional technique for disorders of the salivary ducts.

Other studies that were considered to be relevant to the procedure but were not included in the main extraction table (Table 2) have been listed in Appendix A.

### ***Existing reviews on this procedure***

There were no published reviews identified at the time of the literature search.

### ***Related NICE guidance***

There is no NICE guidance related to this procedure.

**Table 2 Summary of key efficacy and safety findings on interventional sialendoscopy**

Abbreviations: NR – not reported			
Study details	Key efficacy findings	Key safety findings	Comments
<p>Nahlieli (2000) <sup>1</sup></p> <p><b>Case series</b></p> <p><b>Israel</b></p> <p>Study period: unclear</p> <p><b>n =236</b></p> <p>Population: Mean age: Not stated, range 5-85 years. Patients had suspected obstruction of the submandibular glands (149), parotid glands (86) and sublingual gland (1).</p> <p>Indications: When calculus removal by a conventional methods was unsuitable, screening of the ductal system, when positive evidence of ductal dilation or stenosis, recurrent episodes of swelling was without a known cause.</p> <p>Technique: Authors note that they began performing the procedure using first generation equipment (rigid endoscope). They now use third generation equipment which is smaller and includes a semi-rigid endoscope.</p> <p><b>Follow-up: Mean not stated, range 6- 40 months</b></p> <p>Conflict of Interest: not reported</p>	<p><b>Failures</b> Ten procedures were immediate failures due to technical failures (inability to introduce the endoscope into the duct lumen or a ductal perforation before beginning the procedure).</p> <p>Intraoperative failures (n=18) resulted from the inability to remove or eliminate the obstruction.</p> <p>Late failures (n=12) were associated with recurrent obstructive symptoms after endoscopy.</p> <p><b>Detection</b> Obstructions were detected in 170 patients (75%) - 124 (73%) were found in the submandibular ductal system - 46 (27%) were found in the parotid duct - 1 was found in the Bartholin's duct.</p> <p>56 patients had sialadenitis without evidence of obstructions.</p> <p>32% of the submandibular sialoliths, 63% of the parotid sialoliths and the one stone in the Bartholin's duct were undetected before sialendoscopy.</p> <p><b>Recurrence:</b> Four patients reported sialolith recurrence, which occurred 2 years after the procedure and were located near the orifice of the submandibular duct.</p>	<p><b>Complications:</b></p> <p>Perioperative period: Significant swelling of the affected gland was noted in all patients as a consequence of the irrigation technique.</p> <p>1 patient suffered from temporary lingual nerve paraesthesia caused by iatrogenic perforation.</p> <p>2 patients developed a ranula (a cyst on the underside of the tongue)</p> <p>6 patients had a postoperative infection</p> <p>7 patients suffered from ductal strictures, five of them underwent successful dilatation and two underwent sialoadenectomy.</p>	<p>All patients underwent preoperative and postoperative screening by routine radiography, sialography and ultrasound.</p> <p>The authors note a number of microranatomical and pathophysiological phenomena that were encountered. These are not reported here.</p> <p>Authors note that they improvised on existing instrumentation and then designed instruments of their own.</p> <p>Authors note that there are difference between submandibular and parotid sialolithiasis. This means that in parotid gland removal of the obstruction is not always a cure and long term follow-up is necessary.</p>

Abbreviations: NR – not reported			
Study details	Key efficacy findings	Key safety findings	Comments
<p>Ziegler (2004)<sup>4</sup></p> <p>Case-series</p> <p><b>Germany</b></p> <p>1996-2001</p> <p><b>n =72</b></p> <p>Population: Mean age: Not stated, range 12-74 years. 24 patients underwent procedures on the parotid gland and 48 patients underwent procedures on the submandibular gland.</p> <p>Indications: Two groups were included: those in whom a calculus was suspected preoperatively (n=54) and those with inflammatory symptoms of unknown origin (n=18). 41/54 had radio-opaque sialoliths.</p> <p>Technique: Patients underwent standardised endoscopic procedures – however authors note that different procedures and instruments were used depending on the existing intraductal disease.</p> <p><b>Follow-up: Median follow-up 19 months (range 4-49 months).</b></p> <p>Conflict of Interest: Not reported</p>	<p><b>Technical failures:</b> it was not possible to cannulate the salivary duct orifice in four patients due to pre-existing strictures.</p> <p><b>Postoperative failures:</b> 6/72 (8%) had clinical and subjective problems which did not improve after endoscopic intervention – subsequent removal of the submandibular gland was required.</p> <p>6/54 patients (11%) had sialoliths that were too large for the procedure to be performed.</p> <p>Overall success rate for patients with sialolithiasis was 87% (47/54).</p> <p>7/41 (17%) patients had further smaller concretions that had not been detected on the postoperative imaging.</p>	<p><b>Complications:</b></p> <p>Patients had temporary swelling which was mainly caused by retention of the irrigation fluid and which receded within a few days.</p> <p>There were no operative or postoperative morbidity such as nerve injury, bleeding or ductal stricture.</p>	<p>Preoperative workup – clinical examinations and preoperative radiographs those suggestive of sialadenitis also had a sonogram.</p> <p>Scintiscanning was indicated in those patients with reduced excretory function, as proof of a non-functioning gland (contraindication for endoscopy).</p> <p>Sonography was used for follow-up (6 weeks and 6 months)</p> <p>Scintiscan was done after a minimum 2-3 months postoperatively but this was not routine.</p> <p>Definition of failure: if the patient complained of persisting symptoms or required removal of the gland.</p>

Abbreviations: NR – not reported			
Study details	Key efficacy findings	Key safety findings	Comments
<p>Marchal (2002) <sup>3</sup></p> <p>Case series</p> <p><b>Switzerland, France</b></p> <p>Study period: November 1995 – March 2000</p> <p><b>n =129 (135 procedures)</b></p> <p>Population: Mean age 39 years (range 6-93 years). Six patients had bilateral symptoms.</p> <p>Indications: Suspected ductal disease (<b>submandibular</b>).</p> <p>Technique: Most patients had local anaesthesia. Initial procedure is diagnostic sialendoscopy, when a stone or other ductal disorder is located an interventional sialendoscopy is undertaken. For larger stones fragmentation is needed before removal.</p> <p><b>Follow-up: Mean follow-up: 2.5 years (range 3 months – 5 years).</b></p> <p>Conflict of Interest: not reported</p>	<p><b>Diagnostic sialendoscopy</b> was attempted in 135 glands and was possible in 131 ducts (97%); the 4 failures were in 2 patients with complete fibrosis of the Wharton's duct and in 2 patients with spontaneous perforation in the duct.</p> <ul style="list-style-type: none"> <li>- 106 cases of sialolithiasis 74%)</li> <li>- 15 cases of sialodochitis (inflammation) (10.5%)</li> <li>- 8 cases of stenosis (5.6%)</li> <li>- 14 normal ducts (9.8%)</li> </ul> <p>In 12 cases a combination of 2 of the above disorders was found.</p> <p>Mean pain scores (VAS): 2</p> <p><b>Interventional sialendoscopy: n=110</b> More than one procedure was necessary in 28 cases (25%), resulting in failures in 13/28 cases (47%)</p> <p>The procedure was successful in 90 cases, for an overall success rate of 82%.</p> <p>20 cases were considered failures – with 5 patients requiring gland resection.</p> <p>43 patients were found to have large stones – 9 of these patients suffered canal perforations due to canal stripping during stone removal.</p> <p>Mean pain scores (VAS): 3</p>	<p><b>Complications:</b> No complications were encountered during diagnostic sialendoscopy.</p> <p>Interventional sialendoscopy.</p> <ul style="list-style-type: none"> <li>- 11 patients had ductal wall perforation (2 patients required hospitalisation and 1 patient required gland resection)</li> <li>- 2 wire basket blockages</li> </ul>	<p>Preoperative workup: authors note that <b>most</b> of the patients had radiological evaluation studies such as sialography, ultrasonography, magnetic resonance sialography and in some cases CT.</p> <p>Success was defined as the entire Wharton's duct and its primary branches being rendered free from disease.</p> <p>Failures were defined as impossible or unsuccessful procedures or when open gland resection had to be performed.</p> <p>Over the course of the study 4 different endoscopies were used (technology evolved). - authors did an analysis comparing the different endoscopies.</p> <p>Pain was measured using a ten-point visual analogue scale.</p> <p>Authors note that the results of interventional sialendoscopy were directly related to the size of the stone.</p> <p>Authors note that wire basket blockage complications have the potential to result in gland resection.</p>

Abbreviations: NR – not reported			
Study details	Key efficacy findings	Key safety findings	Comments
<p>Marchal (2001) <sup>5</sup></p> <p>Case series</p> <p><b>Switzerland/France</b></p> <p>Study period: November 1995 – March 2000</p> <p><b>n =77 (79 procedures)</b></p> <p>Population: Mean age 41 years (range 6-91 years). Two patients had bilateral symptoms.</p> <p>Indications: Suspected ductal disease (<b>paratoid</b>).</p> <p>Technique: Most patients had local anaesthesia. Initial procedure is diagnostic sialendoscopy, when a stone or other ductal disorder is located an interventional sialendoscopy is undertaken. For larger stones fragmentation is needed before removal.</p> <p><b>Follow-up: not reported</b></p> <p>Conflict of Interest: not reported</p>	<p><b>Diagnostic = 79 procedures</b></p> <p>Diagnostic sialendoscopy was achieved in all 79 ducts. Findings included</p> <ul style="list-style-type: none"> <li>- 50 cases of sialolithiasis (66%)</li> <li>- 6 cases of stenosis (8%)</li> <li>- 31 cases of sialodochitis (39%)</li> <li>- 2 cases of polyps</li> <li>- 13 normal ducts (16%)</li> </ul> <p>In 23 cases a combination of 2 of the above disorders was found.</p> <p>Mean pain scores: 2.4</p> <p><b>Interventional 55 patients</b></p> <p>More than one interventional sialendoscopy was necessary in 25 cases (45%).</p> <p>Sialendoscopy was successful in relieving the ductal obstruction in 47 cases, with an overall success rates of 85%.</p> <p>Mean pain scores: 3</p> <p>Failures 8 patients were due to sialolithiasis embedded in the ductal wall in four cases, unsuccessful dilation of ductal stenosis in two patients and impossibility of technique in two patients.</p> <p>Recurrence of obstructive symptoms occurred in 3 patients at 15, 18 and 24 months.</p>	<p><b>Complications:</b></p> <p>No complications were encountered during diagnostic sialendoscopy.</p> <p>Interventional sialendoscopy (n=6).</p> <ul style="list-style-type: none"> <li>- 3 patients had ductal wall perforation</li> <li>- 3 wire basket blockages (one results in perforation)</li> </ul> <p>In one failed case a parotidectomy was necessary.</p>	<p>Preoperative workup: authors note that <b>most</b> of the patients had radiological evaluation studies such as sialography, ultrasonography, magnetic resonance sialography and in some cases CT.</p> <p>Over the course of the study 4 different endoscopes were used (technology evolved).</p> <p>Success was defined as the entire duct and its primary branches being rendered free from disease.</p> <p>Failures were defined as impossible or unsuccessful procedures or when open gland resection had to be performed.</p> <p>Pain was measured using a ten-point visual analogue scale. However this was only measured in the last 40 patients.</p>



Abbreviations: NR – not reported			
Study details	Key efficacy findings	Key safety findings	Comments
<p>Koch (2005) <sup>6</sup></p> <p><b>Case series</b></p> <p>Germany</p> <p>Study period: January 2001 and December 2003</p> <p><b>n =103</b></p> <p>Population Mean age: 49.5 years (16-82 years). Three patients had bilateral evaluation. In 51.5% (53/103), sialoscopy of Warthon's duct (submandibular) was performed and in 48.5% (50/103) sialoscopy of Stensen's duct (parotid) was undertaken.</p> <p>Indications: Patients who can inconclusive results following ultrasound (swelling of unknown origin).</p> <p>Technique: Two different types of endoscopes were used.</p> <p><b>Follow-up: unclear</b></p> <p>Conflict of Interest: not stated</p>	<p><b>Technical failures</b> 3/103 (2.9%). In 3 patients papillotomy had to be carried out due to a too narrow ostium (submandibular gland)</p> <p>Normal findings were noted in 10.7% (11/103) of all cases. Pathological findings were noted in 89.3% (92/103).</p> <p>Anatomic variations of the ducts were thought to be the reason for unclear swelling in 4 patients (3.9%).</p> <p>Sialolithiasis was diagnosed in 20.3% (21/103) patients, 18.9% (10/53) of submandibular and 22% (11/50) parotid gland.</p> <p>Obstruction due to inflammatory fibrotic stenoses or due to a foreign body of fibrotic plugs was seen in 56.3% (58/103) of all patients, and obstruction affecting the parotid ducts was seen in 56% (28/50) of patients.</p> <p>Submandibular duct stenosis was diagnosed in 56.6% (30/53) of all patients – 14 of whom had a history of sialolithiasis.</p> <p><b>Therapeutic</b> All patients who showed pathologic findings were given conservative treatment.</p> <p>36 patients were treated with therapeutic sialendoscopy. 31/36 (86.1%) of the patients were treated successfully.</p>	<p><b>Complications</b> Postoperative pain sensation and gland swelling due to irrigation was observed for 2-3 hours.</p> <p>In 1 patients, perforation of the Warthon's duct occurred while introducing the endoscope.</p>	<p>Retrospective study.</p> <p>Follow-up period is unclear which is important given the issue of recurrence.</p> <p>While all patients had diagnostic sialendoscopy, not all patients had interventional sialendoscopy.</p> <p>The authors note that gland resection was needed in one patient – however it is unclear if this was a consequence of the procedure/</p>

## ***Validity and generalisability of the studies***

- Other procedures such as laser were also used as part of the interventional sialendoscopy procedure<sup>3</sup>.
- There may be differences in outcomes between parotid and submandibular glands<sup>1</sup>.
- The importance of long term follow-up is unclear, particularly in terms of assessing recurrence in patients with parotid sialolithiasis.
- In many of the studies the instruments used changed or evolved over time.
- In one study<sup>3</sup> the authors note that the results of the procedure were directly related to the size of the stone; with larger stones having a higher failure rate.
- It is unclear whether any of the patients reported in the literature of sialendoscopy studies suffered from malignancy.

## **Specialist advisers' opinions**

*Specialist advice was sought from consultants who have been nominated or ratified by their Specialist Society or Royal College.*

Mr Patrick Bradley, Mr Richard Crosher, Mr S Layton, Professor McGurk and Mr Paul Pracy,

- Most of the Specialist Advisers considered this procedure to be established.
- One Specialist Adviser further commented that while the procedure is new in the UK there are several centres in the USA and Continental Europe with significant experience over the past 10 years.
- The first application of sialendoscopy is diagnostic, but there a number of interventions that can be done endoscopically.
- The procedure should be undertaken in specialised centres.
- There is quite a large population who would be appropriate for diagnostic sialendoscopy but a relatively small number of people needing therapeutic intervention.
- Individual experience is very limited with most surgeons only seeing 5 or 6 cases per year.
- There are no well validated quality of life measures for salivary gland conditions apart from dry mouth and Sjogren's syndrome.
- Very few adverse events have been reported in the literature
- The main controversy is the debate over the need to use stents to maintain patency of the salivary gland duct after interventional procedures.
- Sialendoscopy is opening up new ways of evaluating and treating non stone related disease.

## **Issues for consideration by IPAC**

- This procedure can be used as both a diagnostic and interventional procedure.

- The Committee may wish to discuss the title (indication) and whether to include information on diagnostic utility.
- The published literature would seem to indicate that this is not a new technique but one that has continued to evolve – particularly in terms of the equipment used.

## References

- 1 Nahlieli O and Baruchin AM. (2000) Long-term experience with endoscopic diagnosis and treatment of salivary gland inflammatory diseases. *Laryngoscope* 110: 988-993.
- 2 Gundlach P, Hopf J, and Linnarz M. (1994) Introduction of a new diagnostic procedure: salivary duct endoscopy (sialendoscopy) clinical evaluation of sialendoscopy, sialography, and X-ray imaging. *Endoscopic Surgery & Allied Technologies* 2: 294-296.
- 3 Marchal F, Dulguerov P, Becker M et al. (2002) Submandibular diagnostic and interventional sialendoscopy: new procedure for ductal disorders. *Annals of Otolaryngology, Rhinology & Laryngology* 111: 27-35.
- 4 Ziegler CM, Steveling H, Seubert M et al. (2004) Endoscopy: a minimally invasive procedure for diagnosis and treatment of diseases of the salivary glands. Six years of practical experience. *British Journal of Oral & Maxillofacial Surgery* 42: 1-7.
- 5 Marchal F, Dulguerov P, Becker M et al. (2001) Specificity of parotid sialendoscopy. *Laryngoscope* 111: 264-271.
- 6 Koch M, Zenk J, Bozzato A et al. (2005) Sialoscopy in cases of unclear swelling of the major salivary glands. *Otolaryngology - Head & Neck Surgery* 133: 863-868.

## Appendix A: Additional papers on interventional sialendoscopy for salivary ductal disorders not included in summary Table 2

The following table outlines the studies that are considered potentially relevant to the overview but were not included in the main data extraction table (Table 2). It is by no means an exhaustive list of potentially relevant studies.

Article title	Number of patients/ Study design	Direction of conclusions	Reasons for non-inclusion in Table 2
Baek CH and Jeong HS. (2006) Endoscope-assisted submandibular sialadenectomy: a new minimally invasive approach to the submandibular gland. <i>American Journal of Otolaryngology</i> 27: 306-309.	5 patients Case series	Successful results in 4/5 patients	Larger studies included in table 2
Chu DW, Chow TL, Lim BH et al. (2003) Endoscopic management of submandibular sialolithiasis. <i>Surgical Endoscopy</i> 17: 876-879.	13 patients Case series	Procedure reduces the incidence of missed stones	Larger studies included in table 2
Katz P. (1999) 10 years of salivary gland endoscopy: Report of 882 cases. <i>Radiologie - Journal du Cepur</i> Vol. 19: 169.	Unclear	Unclear	Non-English paper. 10 years experience.
Marchal F, Dulguerov P, Guyot JP et al. (1998) Sialendoscopy and intraductal lithotripsy. <i>Oto-Rhino-Laryngologia Nova</i> Vol. 8: 264.	21 patients Case series	Successful in 75% of cases. No complications.	Non-English paper. Larger studies included in table 2
McGurk M, MacBean AD, Fan KFM et al. (2006) Endoscopically assisted operative retrieval of parotid stones. <i>British Journal of Oral &amp; Maxillofacial Surgery</i> Vol. 44: 160.	8 patients Case series	Successful results in 7/8 patients. No complications	Larger studies included in table 2
Meningaud JP, Pitak-Arnop P, and Bertrand JC. (2006) Endoscope-assisted submandibular sialoadenectomy: a pilot study. <i>Journal of Oral &amp; Maxillofacial Surgery</i> 64: 1366-1370.	5 patients Case series	Successful results in all patients	Larger studies included in table 2
Nahlieli O and Baruchin AM. (1999) Endoscopic technique for the diagnosis and treatment of obstructive salivary gland diseases. <i>Journal of Oral &amp; Maxillofacial Surgery</i> 57: 1394-1401.	154 patients Case series	Success rate was 82% for calculus removed. 9 were immediate failures.	Larger study <sup>1</sup> included in Table 2.
Nahlieli O and Nazarian Y. (2006) Sialadenitis following radioiodine therapy - a new diagnostic and treatment modality. <i>Oral Diseases</i> 12: 476-479.	15 patients Case series	Patients are free from sialadenitis with no complications.	Looking at the procedure following radioiodine therapy. Larger studies included in Table 2.

Article title	Number of patients/ Study design	Direction of conclusions	Reasons for non-inclusion in Table 2
Nahlieli O, and Baruchin AM. (1997) Sialoendoscopy: three years' experience as a diagnostic and treatment modality. <i>Journal of Oral &amp; Maxillofacial Surgery</i> 55: 912-918.	46 patients Case series	Five procedures were immediate failures but the remaining were successful.	Larger studies included in Table 2.
Nahlieli O, Shacham R, Bar T et al. (2003) Endoscopic mechanical retrieval of sialoliths. <i>Oral Surgery Oral Medicine Oral Pathology Oral Radiology &amp; Endodontics</i> 95: 396-402.	217 patients Case series	Success rate of 87%. No severe complications were noted.	Larger study <sup>1</sup> included in Table 2.
Nakayama E, Yuasa K, Beppu M et al. (2003) Interventional sialendoscopy: a new procedure for noninvasive insertion and a minimally invasive sialolithectomy.[see comment]. <i>Journal of Oral &amp; Maxillofacial Surgery</i> 61: 1233-1236.	1 patient Case report	Successful procedure.	Larger studies included in Table 2.
Su YX, Liao GQ, Kang Z et al. (2006) Application of magnetic resonance virtual endoscopy as a presurgical procedure before sialoendoscopy. <i>Laryngoscope</i> 116: 1899-1906.	6 patients Case series	Application of MR as a presurgical procedure is promising	Technical paper about application of MR. Larger studies included in Table 2.
Yuasa K, Nakayama E, Ban S et al. (1997) Submandibular gland duct endoscopy. Diagnostic value for salivary duct disorders in comparison to conventional radiography, sialography, and ultrasonography. <i>Oral Surgery Oral Medicine Oral Pathology Oral Radiology &amp; Endodontics</i> 84: 578-581.	12 patients Case series	Authors note initial results appear promising.	Larger studies included in Table 2.
Zenk J, Koch M, Bozzato A et al. (2004) Sialoscopy--initial experiences with a new endoscope. <i>British Journal of Oral &amp; Maxillofacial Surgery</i> 42: 293-298.	22 patients Case series	Successful in cases with pathological findings. One complications	Larger studies included in Table 2.
Ziegler CM, Hedemark A, Brevik B et al. (2003) Endoscopy as minimal invasive routine treatment for sialolithiasis. <i>Acta Odontologica Scandinavica</i> 61: 137-140.	60 patients Case series	Procedure is more acceptable and have a low complication rate.	Larger study <sup>4</sup> included in Table 2.

## Appendix B: Literature search for interventional sialendoscopy

Database	Date searched	Version searched
Cochrane Library	24/4/2006	March 2006
CRD databases	24/4/2006	2006 Issue 2
Embase	24/4/2006	1980 to 2006 Week 16
Medline	24/4/2006	1966 to April Week 2 2006
Premedline	24/4/2006	April 21, 2006
CINAHL	24/4/2006	1982 to April Week 2 2006
British Library Inside Conferences	24/4/2006	1993 to date
NRR	24/4/2006	2006 Issue 1
Controlled Trials Registry	24/4/2006	N/A

The following search strategy was used to identify papers in Medline. A similar strategy was used to identify papers in other databases.

- 1 (sialendoscop\$ or sialoscop\$ or sialoendoscop\$).tw.
- 2 (fibrescop\$ or fiberscop\$).tw.
- 3 endoscop\$.tw.
- 4 Endoscopy/mt [Methods]
- 5 (minimal\$ adj3 (surg\$ or invasive or access)).tw.
- 6 Surgical Procedures, Minimally Invasive/
- 7 or/1-6
- 8 Salivary Ducts/
- 9 Salivary Gland Diseases/
- 10 Submandibular Gland Diseases/
- 11 Salivary Duct Calculi/
- 12 Parotid Diseases/
- 13 Sialadenitis/
- 14 Parotitis/
- 15 sialolithiasis.tw.
- 16 sialolith\$.tw.
- 17 (salivary adj3 (stone\$ or duct\$ or disorder\$ or disease\$ or swell\$ or infect\$ or calcul\$ or stenosis or polyp\$ or stricture\$)).tw.
- 18 (parotid adj3 (stone\$ or duct\$ or disorder\$ or disease\$ or swell\$ or infect\$ or calcul\$ or stenosis or polyp\$ or stricture\$)).tw.
- 19 (submandibular adj3 (stone\$ or duct\$ or disorder\$ or disease\$ or swell\$ or infect\$ or calcul\$ or stenosis or polyp\$ or stricture\$)).tw.
- 20 sialadenitis.tw.
- 21 sialodochitis.tw.
- 22 (parotiditis or parotitis).tw.

23	or/8-22
24	7 and 23
25	Animals/
26	Humans/
27	25 not (25 and 26)
28	24 not 27