NATIONAL INSTITUTE FOR HEALTH AND CLINICAL EXCELLENCE

INTERVENTIONAL PROCEDURES PROGRAMME

Interventional procedure overview of tonsillectomy using laser

The tonsils are the fleshy pieces of tissue at the back of the throat. This procedure uses laser to remove or reduce the tonsils. Laser can also be used to seal the blood vessels to stop any bleeding.

Introduction

This overview has been prepared to assist members of the Interventional Procedures Advisory Committee 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 December 2005.

Procedure name

- Laser tonsillectomy
- Laser assisted serial tonsillectomy
- KTP laser tonsillectomy

Specialty societies

- British Association of Otorhinolaryngologists, Head and Neck Surgeons

Description

Indications

Indications for tonsillectomy include recurrent acute or chronic tonsillitis, peritonsillar abscess and pharyngeal obstruction/obstructive sleep apnoea. Life-threatening complications of these conditions are rare and the main aim of surgery is to relieve symptoms.

Current treatment and alternatives

Surgical removal of the tonsils (tonsillectomy) is one of the most common surgical procedures in the UK. Traditional 'cold steel' tonsillectomy consists of two stages: removal of the tonsil followed by haemostasis. Bleeding is controlled by pressure, then by ligatures. The use of ligatures may be supplemented by diathermy and the use of packs.

Diathermy uses radiofrequency energy applied directly to the tissue, and can be bipolar or monopolar. The heat generated may be used in dissection to incise the mucosa and remove the tonsils as well as for haemostasis, by coagulating the bleeding vessels. Other methods that use thermal energy include coblation and lasers.

What the procedure involves

Lasers used in tonsillectomy include CO_2, KTP and contact diode lasers. Lasers both dissect tissue and coagulate blood vessels. Lasers can be used to either completely resect (*laser tonsillectomy*), reduce (*laser assisted serial tonsillectomy*) or vaporise (*laser vaporisation tonsillectomy*) tonsillar tissue.

For tonsillectomy, patients receive a general anaesthetic. The tonsil is retracted medially and tonsil is then dissected with the laser. For laser assisted serial tonsillectomy (also referred as laser assisted tonsil reduction) a laser is swept across the tonsil, at a depth of approximately 3-5 mm, partially resecting the tonsil. Further sessions are needed to achieve reduction of around 95% of tonsillar tissue.

Laser vaporisation tonsillectomy is performed under general anaesthesia using mircoscopic control so that around 95% of the tonsils are vaporised in one setting.

Laser assisted tonsillotomy is the partial excision of part of the tonsil, but without intention for subsequent further resection –this procedure did not form part of the overview.

Efficacy

Five comparative studies assessed pain following laser dissection tonsillectomy [1-5]. In four of these studies patients treated with laser reported feeling less pain at the first post-operative assessment (usually within 24 hours) compared with those treated by cold steel dissection, but at subsequent assessments the laser group had higher pain scores than those in the cold steel group until at least 2 weeks after surgery. In the fifth study the authors noted that mean pain scores were consistently lower in the laser group. However this study included child patients, used a different laser and compared laser with diathermy.

Three of the above studies also reported on healing following laser tonsillectomy [2,4,5]. This was typically assessed by noting the amount of mucosa regrowth in the tonsillar bed. In all three studies the authors noted

that wound healing appeared to be slower on the laser side compared with cold steel dissection.

Two studies assessed outcomes following laser assisted serial tonsillectomy [6,7]. Outcomes in both studies were poorly reported.

The majority of Specialist Advisors expressed no concerns about the efficacy of the procedure but noted that postoperative pain was often greater than with other tonsillectomy methods. They also noted that very few clinicians in the UK use lasers for tonsillectomy.

Safety

Bleeding is an important complication of tonsillectomy. It can occur intraoperatively, during the first 24 hours after the operation (defined in most studies as primary haemorrhage) or after 24 hours (secondary haemorrhage). Postoperative haemorrhage may require the patient to be readmitted to hospital and possibly undergo further surgery.

In general it was noted that intraoperative blood loss was less with the use of the KTP laser compared with cold steel dissection. Two out of seven studies reported cases of primary haemorrhaging following laser tonsillectomy. In one randomised controlled trial 11% of patients (9/79) had a primary haemorrhage following laser tonsillectomy compared with 6% of patients (4/72) in the cold dissection group [1] (difference not significant). In the second study, a UK cases series of 54 patients, two patients (4%) had primary haemorrhages [8].

Secondary haemorrhage rates varied among the studies (range 0% [4,3] to 18% [8]). In a small randomised controlled trial of 38 patients undergoing KTP laser tonsillectomy on one side and dissection on the other side (that is, within-patient comparison of the two techniques), six patients had delayed bleeding in the tonsil site operated by laser (two of those events required readmission and treatment with antibiotics to control the bleeding). No patients had delayed bleeding in the dissection group. The highest secondary haemorrhage rates were reported in the UK cases series, where 10 out of 54 patients (18%) had delayed bleeding. One patient in this study also suffered a tongue burn.

These data are in general agreement with results from the National Prospective Tonsillectomy Audit, which found that the lowest rates of secondary haemorrhage (both those requiring and those not requiring further operation) were associated with cold steel dissection with suture haemostasis, with higher rates reported with the use of other thermal techniques such as diathermy[13].

In two studies, no peri-operative or anaesthesia-related complications, neither early or delayed bleeding were reported following laser assisted serial tonsillectomy [6 7].

Specialist Advisors noted that there was slight increase in postoperative haemorrhage compared with cold steel dissection. They also listed potential

complications of using lasers near the face and airway such as laser damage to the patient's face, and heat damage to surrounding tissues.

Literature review

Rapid review of literature

The medical literature was searched to identify studies and reviews relevant to harmonic scalpel for tonsillectomy. Searches were conducted via the following databases, covering the period from their commencement to August 2005: Medline, PreMedline, EMBASE, Cochrane Library and Science Citation Index. An updated literature search was undertaken in December 2005. 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 included. Emphasis was placed on identifying good quality studies. Therefore, good quality non-randomised controlled studies may be included in preference to poorly described randomised trials (for example, those with poor description in terms of randomisation, blinding or reporting of outcomes). 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	Adults or children undergoing tonsillectomy
Intervention/test	Laser tonsillectomy
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 six studies – including two studies that specifically look at laser assisted serial tonsillectomy.

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.

This includes two studies that assess the use of holmium laser in tonsillectomy [9] [10].

Existing reviews on this procedure

There are several Cochrane reviews of tonsillectomy but none that specifically address laser tonsillectomy.

Related NICE guidance

Below is a list of NICE guidance related to this procedure. Appendix B details the recommendations made in each piece of guidance listed below.

Interventional procedures

Published guidance: Electrosurgery (diathermy and coblation) in tonsillectomy
In development: tonsillectomy using the ultrasonic scalpel.

Table 2 Summary of key efficacy and safety findings on laser tonsillectomy

Abbreviations used: NR, not reported; SF-36, short form 36, n=number of patients

<table>
<tr><th>Study details</th><th>Key efficacy findings</th><th>Key safety findings</th><th>Comments</th></tr>
<tr>
<td>Kothari et al. (2002) [1]
UK
Randomised controlled trial
Study period: not stated

79 patients KTP laser tonsillectomy
72 patients standard dissection

Mean age:
KTP laser 15 years
Dissection: 16.5 years
Range not reported.

Technique:
KTP laser machine was set to 10 W and a defocused beam was used for haemostasis.
Dissection: standard cold steel and snare technique was used.
Haemostasis was achieved using bipolar diathermy..

Selection criteria: not stated.

Mean follow-up: 1 month.

Disclosure of interest: not specified.</td>
<td>Outcomes measured: operating time, pain and discomfort, appetite, comfort and mood, health usage and readmission rate.

Operating time (median):
KTP laser: 12 minutes (range 4−29 minutes)
Dissection: 10 min (range 6−24 minutes)

Pain

<table>
<tr><td>Pain</td><td>Day 0</td><td>Day 1</td><td>Day 28</td></tr>
<tr><td>KTP</td><td>n</td><td>n</td><td>n</td></tr>
<tr><td>No pain</td><td>4</td><td>2</td><td>43</td></tr>
<tr><td>Slight pain</td><td>25</td><td>17</td><td>6</td></tr>
<tr><td>Moderate</td><td>25</td><td>28</td><td>7</td></tr>
<tr><td>Bad pain</td><td>18</td><td>14</td><td>9</td></tr>
<tr><td>Severe</td><td>5</td><td>4</td><td>8</td></tr>
<tr><td>Blank</td><td>2</td><td>14</td><td>6</td></tr>
<tr><td>Dissection</td><td></td><td></td><td></td></tr>
<tr><td>No pain</td><td>2</td><td>4</td><td>42</td></tr>
<tr><td>Slight pain</td><td>24</td><td>24</td><td>2</td></tr>
<tr><td>Moderate</td><td>22</td><td>18</td><td>9</td></tr>
<tr><td>Bad pain</td><td>18</td><td>9</td><td>1</td></tr>
<tr><td>Severe</td><td>2</td><td>3</td><td>3</td></tr>
<tr><td>Blank</td><td>4</td><td>14</td><td>15</td></tr>
</table>

Authors note that one month after the surgery 30% of the laser group experienced pain compared with 18% of the dissection group (p=0.056)</td>
<td>Complications:

Blood loss during surgery:
KTP laser: 20 ml (range 0−320 ml)
Dissection: 95 ml (range 4−400 ml)
Significant difference between the two groups p < 0.001.

Postoperative haemorrhage
KTP laser
9 patients (11.3%) had a ‘reactionary’ haemorrhage.
6 patients required readmission for secondary haemorrhage.
3/9 patients needed to have further surgery to control the bleeding.

Dissection:
4 patients (5.5%) had minor ‘reactionary’ bleeding.
3 patients required readmission for secondary haemorrhage.
0/4 patients required a second procedure to control bleeding.

Admission/overnight stay:
In both groups 42% of patients required overnight admission.

<table>
<tr><td>Reasons</td><td>KTP</td><td>Dissection</td></tr>
<tr><td>Bleeding</td><td>9</td><td>4</td></tr>
<tr><td>Return to theatre</td><td>3</td><td>0</td></tr>
<tr><td>Pain</td><td>12</td><td>13</td></tr>
<tr><td>Vomiting</td><td>13</td><td>16</td></tr>
<tr><td>Blood in vomit</td><td>7</td><td>9</td></tr>
</table>
</td>
<td>Randomisation: patients were allocated randomly by computer to a treatment arm.

Assessment at 28-days (by a surgeon) and 1-day (by a nurse) were blind to the type of treatment.

Characteristics of patients not provided – for example sex, reason for surgery.
.</td>
</tr>
</table>

Abbreviations used: NR, not reported; SF-36, short form 36, n=number of patients

<table>
<tr><th>Study details</th><th>Key efficacy findings</th><th>Key safety findings</th><th>Comments</th></tr>
<tr><td></td><td>Appetite (graphically represented in the study paper).
Authors note that there were little differences between the two groups at 1 week but by the second and third weeks, the laser group was still experiencing greater difficulty in eating and drinking.

Mood score: (SF-36 − graphically represented in the study paper)
Authors note that dissection group scored higher and were happier by the end of the second week and that this difference was maintained until the third week.

Healthcare utilisation: contact with GP after surgery.
36 (46%) of patients from the laser group contacted their GP compared with 18 (25%) patients from the dissection group contracted their GP.</td><td><table><tr><td>Anaesthetic</td><td>3</td><td>5</td></tr><tr><td>Patients unhappy about discharge</td><td>4</td><td>14</td></tr></table></td><td></td></tr>
<tr><td>Auf et al. (1997) [2]
UK
Randomised controlled trial (within patient)
Study period: not stated

38 patients KTP laser tonsillectomy (one tonsil)
38 patients standard dissection

Mean/Range age: not stated

Technique:
KTP laser machine was set to 12−14 W and a defocused beam was used for haemostasis.</td><td>Outcomes measured: pain, operating time, healing and slough

Operating time (mean):
KTP laser: 5.7 minutes
Dissection: 5.9 minutes

Pain: mean scores (0 no pain – 10 worse pain)

<table><tr><td>Time</td><td>KTP</td><td>Dissection</td></tr><tr><td>Day 1</td><td>4.0</td><td>5.1 p=0.03</td></tr><tr><td>Day 2</td><td>2.5</td><td>4.0 p=0.002</td></tr><tr><td>2 weeks</td><td>3.4</td><td>1.5 p= 0.005</td></tr><tr><td>4 weeks</td><td>0.2</td><td>0.1 p=.25</td></tr></table></td><td>Complications:

Intraoperative blood loss:
KTP laser: 20 ml
Dissection: 52 ml
Significant difference between the two groups p < 0.01.

Postoperative haemorrhage
KTP laser, out of 38 patients
0 patients had a primary haemorrhage.
6 patients had a secondary haemorrhage of whom 2/6 patients required readmission (but not surgery).

Dissection:</td><td>Randomisation: allocation to treatment group was not described.

Patients and post-operative assessors were blind to treatment..

Characteristics of patients not provided – for example, sex, reason for surgery.</td></tr>
</table>

Abbreviations used: NR, not reported; SF-36, short form 36, n=number of patients

<table>
<tr><th>Study details</th><th>Key efficacy findings</th><th>Key safety findings</th><th>Comments</th></tr>
<tr><td>Dissection: standard cold steel and snare technique was used.
Haemostasis with monopolar diathermy.

Selection criteria: not stated

Mean follow-up: 4 weeks.

Disclosure of interest: not specified.</td><td>Healing (regrowth of the mucosa in the tonsillar bead): mean scores (0 completely healed, 1 partial regrowth, 2 no regrowth)

<table><tr><td>Time</td><td>KTP</td><td>Dissection</td></tr><tr><td>2 weeks</td><td>1.6</td><td>0.6 p=0.0007</td></tr><tr><td>4 weeks</td><td>0.005</td><td>0.5</td></tr></table>
Slough: mean scores (0 – no slough, 3 slough extending)
<table><tr><td>Time</td><td>KTP</td><td>Dissection</td></tr><tr><td>Day 1</td><td>1.4</td><td>1.1 p=0.03</td></tr><tr><td>Day 2</td><td>2.0</td><td>1.8 p=0.09</td></tr><tr><td>2 weeks</td><td>1.2</td><td>0.5 p=0.0006</td></tr><tr><td>4 weeks</td><td>0.1</td><td>0.1</td></tr></table></td><td>No primary or second haemorrhage was observed in any patient.</td><td></td></tr>
<tr><td>D’eredita and Marsh (2004) [3]
USA
Study period: Jan 2001 – Jan 2002
Randomised controlled trial

30 paediatric patients contact diode laser (CDL) laser tonsillectomy
28 paediatric patients monopolar cautery

Median age: (both groups)
5 years (range 2−8 years)

Technique:
Laser machine was set to 4.5 W
Monopolar: 15 W was used in coagulation mode.

Selection criteria: Recurrent tonsillitis and/or airway obstruction caused by</td><td>Outcomes measured: Pain, medication, diet, voice and activity.

Pain (measured by the Wong-Baker FACES pain scale 0–5).

Authors report that mean pain scores were consistently lower for the laser than for cautery.

Patients in the laser group used less medication than those in the cautery group.

Voice changes similar between groups.

No significant differences were found for nausea, vomiting, weight loss or behaviour changes.</td><td>Complications:

Intraoperative blood loss: minimal for both groups (around 5 ml).

Authors report that in both groups no early haemorrhage occurred during the first 24 hours and no late haemorrhage was reported by parents during follow-up.</td><td>Randomisation: patients were allocated randomly by computer to a treatment arm.

Blinding status was not reported.

Outcomes assessed by a self-adminsitered questionnaire.

Follow-up examination was also given at day 10.

In general, outcomes have been poorly reported.</td></tr>
</table>

Abbreviations used: NR, not reported; SF-36, short form 36, n=number of patients			
Study details	**Key efficacy findings**	**Key safety findings**	**Comments**
tonsillar hypertrophy. Mean follow-up: 10 days. Disclosure of interest: not specified.			
Strunk and Nichols (1990) [11] USA Study period: not stated Randomised controlled trial 83conseutive patients • 24 patients underwent KTP laser • 37 patients underwent dissection • 12 patients underwent left laser and right dissection tonsillectomy • 10 patients underwent right laser and left dissection tonsillectomy Mean age: not specified Age range: 3−41 years Technique: Laser machine was set to 9−10 W Dissection: standard cold steel and snare technique was used. Haemostasis was achieved using cautery. Selection criteria: 3 yearsold or older; history of recurrent tonsillitis, chronic tonsillitis, obstructive tonsils and adenoids, obstructive sleep apnoea; no antibiotic therapy before surgery.	**Outcomes measured:** operative time, amount of exudate, return to diet, mouth odour, number of days with an elevated temperature, throat and ear pain and return to physical activity. Operating time (mean): KTP laser (n = 21): 21.19 minutes Dissection (n = 20): 21.40 minutes Left laser (n = 12): 22.33 minutes Right laser (n = 10): 17.15 minutes Amount of exudate: (1 for < 33%, 2 for > 33% but < 66% and 3 for > 66%) KTP laser (n = 15): 3.73 Dissection (n = 28): 2.39 Left laser (n = 9): 3.44 Right laser (n = 7): 3.00 Return to diet: 53% of patients had resumed normal food intake by the third postoperative day. 10.6% of patients had not resumed a normal diet by the tenth day. Authors report no significant differences between the groups in terms of mouth odour, number of days with an elevated temperature, throat and ear pain and return	**Complications:** Intraoperative blood loss: KTP laser: 17.65 ml Dissection: 58.59 ml Significant difference between the two groups p < 0.01. Postoperative bleeding: There were no occurrences of primary haemorrhage. Secondary haemorrhage KTP laser: 1(24) patient had a secondary haemorrhage, which resolved after chemical cautery. Dissection: 1(37)one patient had secondary haemorrhage, which resolved spontaneously. Left laser: 1 patient had a secondary haemorrhage on the right dissection site, which required operative cautery. Right laser: No secondary haemorrhage events were observed (0/10_. One patient in the laser group needed suture ligature to control bleeding.	Randomisation: patients were allocated randomly by computer to a treatment arm. Patients were blinded to treatment until day 10. Outcomes assessed by a questionnaire. A follow-up examination was also given at day 10. Thirty-one patients underwent a tonsillectomy only and 52 patients underwent a tonsillectomy and adenoidectomy. Authors note that laser malfunction (n = 9) necessitated several patients undergoing dissection.

<table>
<tr><td colspan="4">Abbreviations used: NR, not reported; SF-36, short form 36, n=number of patients</td></tr>
<tr><th>Study details</th><th>Key efficacy findings</th><th>Key safety findings</th><th>Comments</th></tr>
<tr><td>Mean follow-up: 10 days.

Disclosure of interest: not specified.</td><td>to physical activity.</td><td></td><td></td></tr>
<tr><td>Saito, Honda and Saito (1999) [4]
Japan
Study period: not stated
Non randomised controlled trial (within patient)

18 patients underwent:
KTP laser on one side
Standard dissection on the other side

Mean age: not specified
Age range: 14−44 years

Technique:
Laser machine was used at 8 W for 11patients and 12 W for 7 patients.
Bipolar cautery was used for some patients to control bleeding.
Dissection: standard cold steel and snare technique was used.

Selection criteria: Adult patients.

Mean follow-up: 2 weeks.

Disclosure of interest: not specified.</td><td>Outcomes assessed: pain, healing, operative time

Pain (patients were asked which side was most painful)

<table><tr><td>Most painful side</td><td>KTP</td><td>Dissection</td><td>Equal</td></tr><tr><td>Second day post surgery</td><td>3</td><td>5</td><td>10</td></tr><tr><td>5 days post surgery</td><td>7</td><td>6</td><td>5</td></tr><tr><td>8 days post surgery</td><td>8</td><td>4</td><td>6</td></tr><tr><td>2 weeks</td><td colspan="3">No difference between the two sides.</td></tr></table>
Healing: (assessed at 2 week)
7/15 (47%) patients showed delayed healing on the laser side
1/15 (7%) showed delayed healing on the conventional side</td><td>Complications:
Authors note that intraoperative blood loss was dramatically reduced with the use of the KTP laser.

Postoperative bleeding:
There were no patients with haemorrhage on the laser surgery side.

1 patient developed a secondary haemorrhage on the conventional side 9 days after surgery.</td><td>Patients were not told which tonsil had been removed with the laser.

Unclear who is assessing pain outcomes and whether this person was blind to treatment allocation.

Pain has not been measured by a validated means – patients asked which side most painful.

Healing assessed by a doctor other than the surgeon involved.

Appears to be some lost to follow-up at 2 weeks (n = 3)</td></tr>
</table>

Abbreviations used: NR, not reported; SF-36, short form 36, n=number of patients

<table>
<tr><th>Study details</th><th>Key efficacy findings</th><th>Key safety findings</th><th>Comments</th></tr>
<tr><td></td><td>Wound healing was also slower on the side treated at 12 W</td><td></td><td></td></tr>
<tr><td>Oas and Barteles (1990) [5]
UK
Study period: November 1987 – February 1989
Non randomised controlled trial (within patient)

31 patients KTP laser tonsillectomy
31 patients standard dissection

Mean age: not specified. Age range 10−35 years.

Technique:
Laser machine was set to 6−12 W and snare technique was used. Haemostasis was achieved using cautery.

Selection criteria: Older than 10 years with a history of recurrent tonsillitis.

Mean follow-up: 1 week (5 patients had 2 weeks follow-up)

Disclosure of interest: Hospital did</td><td>Outcomes measured: pain, healing

Pain (patients were asked which side was most painful)

<table><tr><td>Most painful side</td><td>KTP</td><td>Dissection</td><td>Equal</td></tr><tr><td>Evening of surgery</td><td>5</td><td>25</td><td>1</td></tr><tr><td>3−5 days post</td><td>14</td><td>13</td><td>3 (1 NR)</td></tr><tr><td>1 week</td><td>18</td><td>9</td><td>2 (I NR)</td></tr></table>
Healing: (assessed at 1 week)
17 sides − fossae appeared to show equal healing
13 sides − the fossae that were conventionally dissected showed better healing.
1 case − the laser side showed more rapid healing.

5 patients were asked to return for follow-up at 2 weeks. Authors note that there seemed to be a trend for the laser side to show</td><td>Complications:

Intraoperative blood loss: authors note that with few exceptions, most patients experienced less blood loss with laser tonsillectomy.

Postoperative bleeding:
Authors note that there was
1 primary haemorrhage which occurred on the dissection side

1 secondary haemorrhage which occurred on the laser side on fifth postoperative day.</td><td>Patients were not told which tonsil had been removed with the laser.

Unclear who assessed pain outcomes and whether this person was blind to treatment allocation.

Healing was assessed by the surgon by noting the degree of mucosal reepithelisalisation in the tonsillar fossa, the amount of exudate and the degree of surrounding erythema.

Pain has not been measured by a validated means – patients asked which side most painful.</td></tr>
</table>

Abbreviations used: NR, not reported; SF-36, short form 36, n=number of patients			
Study details	**Key efficacy findings**	**Key safety findings**	**Comments**
not charge individuals involved in study.	delayed healing.		
Krespi YP New York, USA Date not stated (published 1994) Case series (over 48 months) n = 86 adults with chronic recurrent tonsillitis, chronic sore throat, severe halitosis or airway obstruction Mean age: 26 years, range 18−63 years Technique: Laser assisted serial tonsillectomy. Laser is swept across the tonsils.8-10 sides. No inclusion/exclusion criteria Mean follow-up at 1 and 4 weeks postoperatively Disclosure of interest: not specified	**Outcomes measured:** 52 (60%) required 1 session 32 (37%) required 2 sessions 84 (98%) 'relieved of symptoms' (time to outcome not specified) 'Minimal' postoperative pain (time to outcome not specified) 'Patients returned to work/school immediately or within 12 to 48 hours'	**Complications:** No peri-operative or anaesthesia-related complications No early or delayed bleeding	Two patients refused second session and elected for conventional tonsillectomy. Proportions of patients with each indication not provided. Baseline severity of symptoms not presented. No information on how outcomes were measured.

Abbreviations used: NR, not reported; SF-36, short form 36, n=number of patients			
Study details	**Key efficacy findings**	**Key safety findings**	**Comments**
Remacle et al. [7] Belgium January 1998 – January 2002 Case series 66 adults underwent CO laser assisted tonsillectomy Mean age: 44 years Age range: 16−78 years Technique: Extended serial tonsillectomy vaporising 80−90% of the palatine lymphoid tissue. Laser settings 18 W. Selection criteria: Patients with a history of chronic tonsillitis. Follow-up: minimum 6 months. Disclosure of interests: not specified.	Outcomes measured: pain The median value results for pain scored 4.5 (range 0−10) for the general anaesthesia group and 5 (range 0−10) for the local anaesthesia group. Pain lasted for 3 days (range 0−15).	Complications: Authors note that to achieve haemostasis monopolar electrocautery was required for two patients. No second time surgery has been necessary for bleeding control.	Patients underwent either local (n = 49) or general anaesthesia (n = 17) One or more sessions required.

Abbreviations used: NR, not reported; SF-36, short form 36, n=number of patients			
Study details	**Key efficacy findings**	**Key safety findings**	**Comments**
Raine et al. (1995) [8] UK Study period: not stated Case series 54 adults underwent KTP laser tonsillectomy Mean age: not stated Age range: 16−51 years Technique: The laser was set at 6−12 W on continuous mode to dissect each tonsil. Larger vessels were cauterised with bipolar diathermy or occasionally ligated if necessary. Selection criteria: Unclear. Follow-up: unclear. Disclosure of interests: not specified.	**Outcomes assessed: (see aim of paper)** – discharge at 6 hours.	**Complications**: 17 patients developed complications following tonsillectomy: - 2 patients had primary postoperative haemorrhages which stopped spontaneously and did not require further surgery. - 10 patients (these included the two above) had secondary haemorrhages which were managed without further surgical intervention. - 3 patients suffered pain on swallowing between 2 and 5 days which required readmission - 1 patient suffered a burn to the tongue - 2 patients had pain and altered taste - 1 patient experienced a hypotensive bradycardiac episode as a result of anaesthetic intravenous antibiotics.	Aim of the study was to assess whether the technique would facilitate day-case adult tonsillectomy. Pain was measured but was not reported on in the paper. Limited information about patient characteristics. No analyses undertaken of those patients who received 6 W compared with those who received 12 W.

Validity and generalisability of the studies

- The studies varied in the types of lasers used, the power settings used and the laser technique used to remove the tonsils.
- These differences will have an impact on the generalisability of the results and should be taken into consideration when looking at individual studies and comparing between studies. For example, in regard to KTP laser there is some suggestion that a low power setting (less than 10 W) is insufficient for effective coagulation and would therefore result in increased bleeding [12].
- In some studies, when using laser, additional subsequent techniques (such as diathermy) were used to achieve intraoperative haemostasis.
- Follow-up in the studies ranged from 7 days to 6 months. Secondary haemorrhage is frequently defined as being 24 hours (and up to 10 days) after the operation. Therefore studies with shorter-term follow-up may not capture all secondary haemorrhages.
- Studies also varied in terms of the age of study participants. The majority of studies reported on adult patients but several studies did assess laser tonsillectomy in paediatric patients.
- Very few studies reported on the experience of the surgeons undertaking laser tonsillectomy.

Specialist Advisors' opinions

Specialist advice was sought from consultants who have been nominated or ratified by their Specialist Society or Royal College
Mr Michael Timms, Mr Liam Flood, Mr N Marks, Mr G Bates, Mr East, Mr Brown

- There are several lasers in surgical use, varying in aspects such as wavelength, and coagulation and cutting characteristics.
- Very few clinicians in the UK use laser tonsillectomy.
- There is a need for training and certification as with all tonsillectomy procedures.
- Patients can experience high levels of postoperative pain.
- Lasers are now being used for subtotal removal of tonsils (tonsillotomy).

Issues for consideration by IPAC

- This overview looks at evidence on linked by different procedures all involving laser removal of tonsilar tissue (i.e. tonsillectomy, serial tonsillectomy).

- This procedure was originally notified to SERNIP. The more recent studies using laser compare laser tonsillectomy with laser tonsillotomy (subtotal tonsillectomy) – indicating a possible change in the role of lasers in tonsillectomy.

- This overview does not include evidence on laser tonsillotomy. It would seem that tonsillotomy is often undertaken in children with obstructive symptoms caused by tonsillar hyperplasia such as snoring or sleep apnoea.

- As not all tonsilar tissue is fully resected in the serial and vapourising tonsillectomy techniques, for these two conditions long term outcomes in relation to symptoms and signs related to the indication for surgery would have been useful.

- The National Prospective Tonsillectomy Audit collected data on laser tonsillectomy, the number of included procedures is very small and corresponds to only a few surgeons. Data could not be provided as the sample size is too small to allow for a robust statistical analysis and can be also disclosive of the surgeon’s identity.

References

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13. British Association of Otorhinolaryngologists – Head and Neck Surgeons Comparative Audit Group and the Clinical Effectiveness Unit, The Royal College of Surgeons of England (2005) *National Prospective Tonsillectomy Audit FINAL REPORT of an audit carried out in England and Northern Ireland between July 2003 and September 2004.* London: Royal College of Surgeons. Available from: www.tonsil-audit.org

Appendix A: Additional papers on laser tonsillectomy not included in the summary tables

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	Study design/Number of patients	Main outcomes	Reasons for non-inclusion
Andrews PJ, Latif A (2004) Outpatient laser tonsillar ablation under local anaesthetic. *European Archives of Oto-Rhino-Laryngology* 261:551−4.	Cases series 19 patients CO2 laser	75% of patietns did not experience further episodes of tonsillitis 12 months after the procedure.	Survery sent to 19 patients – 74% response rate. Small numbers and limited outcomes.
Bartels JP, Oas RE (1990) Use of KTP-532 laser delays healing in tonsillectomy. *Clinical Laser Monthly* 8:167−9.	Case series 12 patients	Later paper included in overview [5]	Later paper included in overview [5]
Linden BE, Gross CW, Long TE et al. (1990) Morbidity in pediatric tonsillectomy. *Laryngoscope* 100(2 Pt 1):120−4.	Randomised controlled trial. 80 patients (8 study groups – 10 patients in each group)	Authors conclude that if diathermy or KTP laser tonsillectomy was used, patients has a better postoperative course if antibiotics were administered. KTP laser resulted in morbidity comparable to diathermy.	Small numbers of patients in each group. Results were presented as figures rather than absolute numbers.
Martinez SA, Akin DP (1987) Laser tonsillectomy and adenoidectomy. *Otolaryngologic Clinics of North America* 34(4) 371−6.	Primarily a review paper. 500 patients	Procedure results in less pain, quicker healing less blood loss. 1 patients had to be readmitted due to bleeding.	Limited information .One paragraph on results.
Moryama I, Nobori T, Nishizano H et al. (1992) A new instrument for use with Nd:YAG in tonsillectomy. *Journal of Clinical Laser Medicine & Surgery* 10:47−50.	Case series 51 cases ND:YAG laser	Few results are given. Two cases have been reported on and any comparative data has been described in terms of less and more.	See main outcomes section
Oswal VH, Bingham BJG (1992) A pilot study of the holmium YAG laser in nasal turbinate and tonsil surgery. *Journal of Clinical Laser Medicine & Surgery* 10:211−6.	Case series 10 patients ND: YAG laser	Tonsillectomy was almost bloodless, with little pain after surgery. The tonsil beds healed within 2 weeks.	Limited information is reported on outcomes following tonsillectomy.
Remacle M, Lawson G, Decat M et al. (1994) Treatment of lingual tonsillitis by transoral CO_2 laser endoscopy. *European Archives of Oto-Rhino-Laryngology* 251:263−6.	Case series 100 patients $C0_2$ laser	Symptoms related to tonsil or tongue inflammation were eliminated or alleviated in 87 patients.	Treatment of lingual tonsillitis. Limited outcomes.

Article title	Study design/Number of patients	Main outcomes	Reasons for non-inclusion
van Overbeek JJ, te Rijdt JP (1995) Laser surgery in lingual tonsil hyperplasia. *Advances in Oto-Rhino-Laryngology* 49:130−1.	Case series 76 patients CO_2 laser	Authors note: ' we were confronted with a postoperative haemorrhage 4 times, in one case with a fatal course.'	Treatment of lingual tonsil hyperplasia. Limited outcomes.

Appendix B: Related NICE guidance for laser tonsillectomy

Guidance	Recommendation
Interventional procedures guidance no. 150	1.1 Current evidence on the safety and efficacy of electrosurgery (diathermy and coblation) for tonsillectomy appears adequate to support the use of these techniques, provided that normal arrangements are in place for consent, audit and clinical governance. 1.2 Surgeons should avoid excessive use of diathermy during tonsillectomy. Surgeons using diathermy in tonsillectomy for dissection and/or haemostasis should be fully trained in its use and should understand the potential complications. 1.3 Use of coblation for tonsillectomy can result in higher rates of haemorrhage than other techniques and clinicians wishing to use coblation should be specifically trained. The British Association of Otorhinolaryngologists – Head and Neck Surgeons has agreed to produce standards for training. 1.4 Surgeons should ensure that patients or their parents/carers understand the risk of haemorrhage after tonsillectomy using these techniques. In addition, use of the Institute's *Information for the public* is recommended. 1.5 Surgeons should audit and review the rates of haemorrhage complicating tonsillectomy in their own practices and in the context of the techniques they use. Publication of further information about the influence of different techniques and other factors (such as age) on the incidence of haemorrhage after tonsillectomy would be useful in guiding future practice.
Technology appraisals	None relevant
Clinical guidelines	None relevant
Public health	None relevant

Appendix C: Literature search for laser tonsillectomy

The following search strategy was used to identify papers in Medline. A similar strategy was used to identify papers in EMBASE, Current Contents, PreMedline and all EMB databases.

For all other databases a simple search strategy using the key words in the title was employed.

Databases	Version searched (if applicable)	Date searched
The Cochrane Library	The Cochrane Library 2005, Issue 3	17/08/2005
CRD		18/08/2005
Embase	1980 to 2005 Week 33	17/08/2005
Medline	1966 to August Week 1 2005	17/08/2005
PreMedline	August 16, 2005	17/08/2005
CINAHL	1982 to August Week 2 2005	17/08/2005
British Library Inside Conferences (limited to current year only)		18/08/2005
National Research Register	2005 Issue 3	18/08/2005
Controlled Trials Registry		18/08/2005

Search strategy used in Medline

1. (laser$ adj3 (assisted or surg$ or microsurg$ or serial$)).tw.
2. Laser Surgery/
3. LASERS/tu [Therapeutic Use]
4. (laser$ adj5 (CO2 or Nd Yag or Yag or KTP or Diode or argon or ultraviolet or UV)).tw.
5. or/1-4
6. tonsil$.tw.
7. *tonsillitis/
8. *tonsil/
9. *tonsillectomy/
10. or/5-8
11. 4 and 9
12. animal/ not human/
13. 11 not 12