

# NATIONAL INSTITUTE FOR CLINICAL EXCELLENCE

## INTERVENTIONAL PROCEDURES PROGRAMME

### Interventional procedures overview of interstitial laser therapy for fibroadenomas of the breast

#### ***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 December 2004.

#### ***Procedure name***

- Interstitial laser therapy
- Interstitial laser photocoagulation

#### ***Specialty societies***

- Royal College of Radiologists
- British Association of Endocrine Surgeons
- British Society of Interventional Radiology
- British Medical Laser Association

#### ***Description***

##### **Indications**

A fibroadenoma is a benign (non-cancerous) solid lump of tissue, which is thought to result from increased sensitivity to the hormone oestrogen. It normally has a rubbery texture, is smooth to the touch and moves easily under the skin. Fibroadenomas are very common and it is not unusual to have more than one. They are mostly found in young women but can occur in women of any age(1).

Most fibroadenomas stay the same size. Some get smaller and some will eventually resolve. These overview relates to options for breast fibroadenomas that do not resolve

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

Once a diagnosis has been confirmed treatment is often not necessary, and annual review will suffice. If the fibroadenoma persists or grows, or if the patient is anxious for it to be removed, it can be taken out by a small open operation under a general anaesthetic.

## What the procedure involves

Laser therapy aims to destroy the tissue that has formed the fibroadenoma by the use of high-energy light. In this technique laser light is delivered to the lesion(s) via fibres positioned through needles inserted percutaneously into the breast under local anaesthetic, and guided to the fibroadenoma by imaging equipment, usually ultrasound(2). The presterilised bare fibre is passed a short distance beyond the tip of the needle, and laser energy is delivered through this fibre. The energy is delivered in continuous wave mode for a few minutes. For larger lesions multiple needles are inserted 1 cm apart, with a laser fibre through each.

The potential benefits of interstitial laser therapy are possibly lower rates of infection than open surgery, and a more acceptable aesthetic result.

### Efficacy:

In one paper, Interstitial laser therapy reduced lesion size (as assessed by ultrasound measurement) from a mean length of 25mm at baseline to 14mm at 3 months, 10mm at 6 months, and 0mm at 12 months in 24 patients(3). In cases that had reached 12 months of follow up, clinical examination revealed that no cases had palpable fibroadenomas.

In another paper At 8 weeks post interstitial laser therapy the mean volume of lump in 27 women was 0.68cm<sup>3</sup> which was significantly smaller than at baseline 2.17 cm<sup>3</sup> (p<0.001). However at 8 weeks 37% (10/27) of patients had a residual lump of >1cm(4). Clinical assessment of the lumps again showed a significant decrease in volume post Interstitial laser therapy with a mean of 1.25 cm<sup>3</sup> compared to 2.60 cm<sup>3</sup> at baseline

### Safety:

In 24 women under going interstitial laser therapy 83% (20/24) reported some discomfort during the procedure, and severe pain in 17% (4/24) led to the treatment being stopped prematurely(3). In both case series of 24 and 27 patients all complained of tenderness in the remaining lesion, which lasted from one to eight weeks.

Skin blanching at the needle site was recorded in 30% (8/27) of cases (4), and bruising was seen in 17% (4/24) of patients, which resolved within a week(3).

## Literature review

### Rapid review of literature

The medical literature was searched to identify studies and reviews relevant to interstitial laser therapy for breast fibroadenomas. Searches were conducted via the following databases, covering the period from their commencement to 7 September 2004 MEDLINE, PREMEDLINE, EMBASE, Cochrane Library and Science Citation Index. Trial registries and the Internet were also searched. No language restriction was applied to the searches.

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

<b>Characteristic</b>	<b>Criteria</b>
Publication type	Clinical studies 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	Women with breast fibroadenomas of 1 year duration or longer.
Intervention/test	Local interstitial laser photocoagulation or hyperthermia of the fibroadenoma tissue.
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 two case series

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

No existing systematic reviews or evidence based guidelines were located on the topic of interstitial laser therapy for breast fibroadenomas during the literature search.

**Table 1 Summary of key efficacy and safety findings on selective internal radiation therapy**

Abbreviation used: US – Ultrasound, ILP – interstitial laser photocoagulation, MRI – magnetic resonance imaging

Study Details	Key efficacy findings	Key safety findings	Comments																														
<p>Basu S (1999)(4)</p> <p>Case series</p> <p>India</p> <p>27 patients</p> <p>Mean age 21.77 yrs (40% in range 16–20 yrs), duration of lump 16.4 months</p> <p>Thirty consecutive patients. 3 (10%) lost to follow-up and omitted from study (no comparison of clinical or demographic characteristics made)</p> <p>Inclusion criteria: Age &lt; 35 years, fibroadenoma confirmed by fine needle aspiration cytology, lumps &lt; 2 cm diameter</p> <p>Exclusion criteria, lumps &lt; 1 year duration, pregnancy</p> <p>With sonographic guidance a Nd:YAG laser (1,064nm) used with 600<math>\mu</math> fibres. 2 watts of laser energy delivered in continuous wave mode for 300 seconds.</p> <p>Follow-up at 2,4, and 8 weeks at which the local area was examined, and sizes of lumps assessed, and any complication or side effect noted</p> <p>Data analysed using paired t-test</p>	<p><b>Ultrasound assessment</b></p> <p>Assessment at each time period showed decrease in lump size as assessed by sonographic evaluation in three dimensions</p> <table border="1"> <thead> <tr> <th></th> <th>Mean (cm<sup>3</sup>)</th> <th>SD</th> </tr> </thead> <tbody> <tr> <td>Baseline</td> <td>2.17</td> <td>1.03</td> </tr> <tr> <td>2 weeks</td> <td>1.56</td> <td>0.69</td> </tr> <tr> <td>4 weeks</td> <td>0.98</td> <td>0.45</td> </tr> <tr> <td>8 weeks</td> <td>0.68</td> <td>0.39</td> </tr> </tbody> </table> <p>A statistically significant decrease in size was found from baseline (<math>p &lt; 0.001</math>)</p> <p>At week 8 US showed decrease in size of lump and a nearly homogenous echo-pattern that had merged with the echoes of normal breast parenchyma</p> <p><b>Clinical assessment</b></p> <table border="1"> <thead> <tr> <th></th> <th>Mean (cm<sup>2</sup>)</th> <th>SD</th> </tr> </thead> <tbody> <tr> <td>Baseline</td> <td>2.60</td> <td>0.79</td> </tr> <tr> <td>2 weeks</td> <td>2.83</td> <td>0.98</td> </tr> <tr> <td>4 weeks</td> <td>1.89</td> <td>0.65</td> </tr> <tr> <td>8 weeks</td> <td>1.25</td> <td>0.60</td> </tr> </tbody> </table> <p>A statistically significant decrease in size was found from baseline (<math>p &lt; 0.001</math>)</p> <p>Increase in size at week 2 may be attributed to inflammatory oedema</p> <p><b>Other</b></p> <p>At 8 weeks 37% of patients (10/27) had residual lumps of &gt; 1 cm diameter and these underwent excision biopsy</p>		Mean (cm <sup>3</sup> )	SD	Baseline	2.17	1.03	2 weeks	1.56	0.69	4 weeks	0.98	0.45	8 weeks	0.68	0.39		Mean (cm <sup>2</sup> )	SD	Baseline	2.60	0.79	2 weeks	2.83	0.98	4 weeks	1.89	0.65	8 weeks	1.25	0.60	<p><b>Complications</b></p> <p>All patients complained of a sensation of warmth felt locally with the procedure, which subsided</p> <p>Blanching of the skin at the needle site was seen in 30% (8/27) patients after 80–100 seconds of the procedure. All these patients went on to develop epithelial breakdown and hyperpigmentation in the same area</p> <p>At 2 weeks all patients commented that the remaining lumps were tender, this remained to week 8 but tenderness was reduced</p> <p>Mild discharge of greyish white, cheesy material was seen at the puncture site of 2 patients. It was non-purulent and subsided in a few days</p> <p>No keloid formations, local infection or abscesses were seen</p>	<p>Age limit imposed on study because in most patients older than 40 years most surgeons would advise excision biopsy.</p> <p>Clinical assessment of lump size made in two dimensions (cm<sup>2</sup>) whereas ultrasound assessment was made in three dimensions (cm<sup>3</sup>) so cannot be directly compared.</p> <p>Relatively short follow-up period of 8 weeks.</p> <p>Minimally invasive and functionally acceptable in patients, particularly those prone to keloid formation following surgical scar.</p> <p>Potential for multiple sessions where more than one fibroadenoma is present.</p> <p>Further investigation required to assess optimal laser energy requirements in relation to lump size.</p> <p>No details of source of funding stated.</p>
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Abbreviation used: US – Ultrasound, ILP – interstitial laser photocoagulation, MRI – magnetic resonance imaging

Study Details	Key efficacy findings	Key safety findings	Comments															
<p>Lai LM (1999)(3)</p> <p>Case series</p> <p>UK (two centres)</p> <p>24 patients (29 fibroadenomas)</p> <p>16 patients had rejected surgical removal, and a further 8 recruited after early success</p> <p>Median age 26 years (range 18–42 years), median size of lesions 25 mm (range 14–35 mm)</p> <p>Patients followed up at 2 to 4 weeks after treatment, and ultrasound was repeated at 3, 6 and 12 months. Follow up to 12 months (with ultrasound assessment was 41% (12/29). 6 patients (25%) underwent surgical excision following ILP so were unavailable for follow-up</p> <p>Inclusion criteria: fibroadenoma breast lumps proven on clinical examination, ultrasound, and aspiration cytology</p> <p>Fibroadenoma located by ultasonography. 1 to 4 needles (size 19 G) inserted percutaneously into the fibroadenoma, tips of needles 1 cm apart where multiple sites used. A fibre inserted through the needle(s) to protrude 4 to 5 mm from the needle. A semiconductor diode laser via a beam-splitter used. 2.5W per fibre used for 500s.</p>	<p><b>Ultrasound assessment</b></p> <p>Assessment at each time period showed decrease in lump size, percentage reduction was also calculated (data not presented here). The number of patients available at follow-up fell at 12 months because some cases had not yet reached that time-point at the time of publication</p> <table border="1" data-bbox="633 451 1202 603"> <thead> <tr> <th></th> <th>Mean (mm)</th> <th>Range</th> </tr> </thead> <tbody> <tr> <td>Baseline</td> <td>25</td> <td>14–35</td> </tr> <tr> <td>3 months</td> <td>14</td> <td>0–23</td> </tr> <tr> <td>6 months</td> <td>10</td> <td>0–19</td> </tr> <tr> <td>12 months</td> <td>0</td> <td>0–10</td> </tr> </tbody> </table> <p><b>Clinical examination</b></p> <p>Of the 14 cases to have reached 12-month follow-up, none had palpable fibroadenomas.</p> <p>No lump had increased in size, bar some temporary oedema in the first few days following ILP.</p> <p><b>MRI assessment</b></p> <p>Of the 17 lesions that were assessed with contrast enhanced MRI at baseline and at 2 to 6 weeks follow-up, 11 were depicted as discrete, strongly enhancing masses compared to pre-treatment images. 6 showed no change in the lesions.</p>		Mean (mm)	Range	Baseline	25	14–35	3 months	14	0–23	6 months	10	0–19	12 months	0	0–10	<p><b>Complications</b></p> <p>Among the patients undergoing ILP 83% (20/24) reported feeling some discomfort while the laser was activated. They were able to tolerate the procedure satisfactorily with the use of intravenous analgesia and sedation in addition to the local anaesthetic in the breast</p> <p>Severe pain was experienced by (4/24) 17% of patients and the treatment was stopped prematurely</p> <p>Local tenderness and swelling was reported by all patients following ILP. Tenderness and sensitivity to touch persisted for a median 1 week (range 1 day to 5 weeks)</p> <p>Bruising was seen in 17% of patients (4/24) but was resolved by 1 week in all cases</p> <p>Small skin burns were seen in three patients, and in one of these a clear oily discharge persisted for 3 weeks. These lesions all healed without further intervention</p>	<p>Not stated what measurement of lump by ultrasound is reported (assumed that longest axis is reported).</p> <p>This intervention used multiple needle and laser sites for larger lumps.</p> <p>In patients who had to terminate the ILP due to pain the fibroadenomas healed well despite the full energy not being delivered. This raises the question of appropriate power and time delivery.</p> <p>Burns could have been prevented by more vigilant monitoring of skin temperature and checking the position of the fibre tip beyond the end of the needle.</p> <p>No analysis of consistency of efficacy or safety between centres.</p> <p>Not stated how many different operators were involved.</p> <p>Large apparent loss to follow-up at 1 year because some patients had not yet reached that time point</p>
	Mean (mm)	Range																
Baseline	25	14–35																
3 months	14	0–23																
6 months	10	0–19																
12 months	0	0–10																

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

- One study initially approached patients on a waiting list of those who were to undergo surgery, and encouraged them to elect to have interstitial laser therapy instead.
- Because lesions may heal themselves, it is difficult to determine efficacy of therapy against a baseline. .
- Relatively short follow-up periods in the studies may not capture long-term complications.

### ***Specialist Advisors' opinions***

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

None of the specialist advisors identified has undertaken the procedure in question

- The major benefit of interstitial laser therapy over surgical removal of lump is the lack of scarring
- Therapy reduces lump volume well, but recurrence rates are not known
- The size of lump that can be treated with interstitial laser therapy is not yet certain
- Adverse events reported include local burns at needle site, and theoretical complications include local infection, and bleeding if needle strikes a blood vessel
- The lack of material for biopsy with this procedure means that confirmation that lump was benign cannot be achieved.
- The procedure could be carried out by radiologists or breast surgeons, with normal training in use of laser equipment.
- Given that fibroadenomas are a common condition the impact of interstitial laser therapy for this indication could be large and might be expected to be undertaken in most District general hospitals

### ***Issues for consideration by IPAC***

- There may be an age subgroup who might benefit more from this therapy.
- Benign breast lumps may require no intervention and may spontaneously resolve.

**References**

- (1) Breast Cancer Care. Fibroadenomas. Breast cancer care 2003.
- (2) Bown SG. Science, medicine, and the future. New techniques in laser therapy. BMJ 1998; 316(7133):754-757.
- (3) Lai LM, Hall-Craggs MA, Mumtaz H, Ripley PM, Davidson TI, Kissin MW et al. Interstitial laser photocoagulation for fibroadenomas of the breast. Breast Vol 8(2)(pp 89-94), 1999 1999;(2):89-94.
- (4) Basu S, Ravi B, Kant R. Interstitial laser hyperthermia, a new method in the management of fibroadenoma of the breast: A pilot study. Lasers in Surgery & Medicine 25(2):148-52, 1999.

## Appendix A: Literature search for interstitial laser therapy for fibroadenomas of the breast

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

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

#	Search History	Results	Display
1	fibroadenom\$.tw. <a href="#">Details</a>	1961	<a href="#">Display</a>
2	Fibroadenoma/bl, pa, bs, pp, ra, co, ri, di, rt, rh, se, ep, su, th, et, us, ul, me, mo [Blood, Pathology, Blood Supply, Physiopathology, Radiography, Complications, Radionuclide Imaging, Diagnosis, Radiotherapy, Rehabilitation, Secretion, Epidemiology, Surgery, Therapy, Etiology, Ultrasonography, Ultrastructure, Metabolism, Mortality] <a href="#">Details</a>	762	<a href="#">Display</a>
3	1 or 2 <a href="#">Details</a>	2285	<a href="#">Display</a>
4	lump\$.tw. <a href="#">Details</a>	4958	<a href="#">Display</a>
5	lesion\$.tw. <a href="#">Details</a>	370878	<a href="#">Display</a>
6	3 or 4 or 5 <a href="#">Details</a>	376493	<a href="#">Display</a>
7	breast\$.tw. <a href="#">Details</a>	147370	<a href="#">Display</a>
8	exp Breast/ <a href="#">Details</a>	19042	<a href="#">Display</a>
9	7 or 8 <a href="#">Details</a>	152497	<a href="#">Display</a>
10	laser\$.tw. <a href="#">Details</a>	74609	<a href="#">Display</a>
11	exp Laser Surgery/ <a href="#">Details</a>	21570	<a href="#">Display</a>
12	Laser Therapy, Low-Level/ <a href="#">Details</a>	391	<a href="#">Display</a>
13	lasers/tu <a href="#">Details</a>	9741	<a href="#">Display</a>
14	(therm\$ adj3 coagul\$).tw. <a href="#">Details</a>	382	<a href="#">Display</a>
15	(photo\$ adj3 coagul\$).tw. <a href="#">Details</a>	165	<a href="#">Display</a>
16	or/10-13 <a href="#">Details</a>	80024	<a href="#">Display</a>
17	or/14-16 <a href="#">Details</a>	80358	<a href="#">Display</a>
18	6 and 9 and 17 <a href="#">Details</a>	96	<a href="#">Display</a>
19	limit 18 to english language <a href="#">Details</a>	85	<a href="#">Display</a>