

# NATIONAL INSTITUTE FOR HEALTH AND CLINICAL EXCELLENCE

## INTERVENTIONAL PROCEDURES PROGRAMME

### Interventional procedure overview of therapeutic percutaneous image-guided aspiration of spinal cysts

This procedure involves using imaging to guide the drainage of spinal cord cysts. These occur rarely, and may cause symptoms such as pain or loss of movement or sensation.

## 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 2006

## Procedure name

- Image guided spinal cyst aspiration.

## Specialty societies

- British Society of Neuroradiologists
- Association of British neurologists
- Society of British neurological surgeons

## Description

### *Indications*

Spinal cysts. There are several different types of such cysts.

Tarlov or perineural cysts are lesions of the nerve root most commonly found in the sacral region of the spine. The majority of cysts are asymptomatic,

however they may occasionally cause symptoms such as radicular pain, or urinary dysfunction.

Arachnoid cysts develop as a result of a defect of the dura, either congenital, developmental, traumatic, or post-spinal surgery, causing the arachnoid to form a cyst or other blockage to normal CSF flow which can cause radicular pain or loss of neurological function. These cysts tend to develop in the thoracic region of the spine.

Spinal echinococcal cysts are a rare development in patients with hydatid disease (a parasitic disorder), where these arise in the vertebral column they may again cause impingement of the spinal cord causing radicular pain or loss of motor function.

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

Depending on the severity of symptoms painful spinal cysts can be managed by analgesic therapy. Open surgery to drain or remove cysts may be indicated if pain is refractory to medical therapy or neurological function is threatened. .

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

Image guided needle aspiration of cysts can be used as part of a diagnostic work up to test whether surgery might be worthwhile (with aspirate analysed by laboratory testing). Aspiration can also be used as a therapeutic procedure with the intent of decreasing cyst volume to relieve symptoms caused by pressure on the spinal cord.

The procedure is usually undertaken under local anaesthesia. A small gauge needle is inserted into the cyst using imaging guidance. A range of image guidance modalities have been used as part of this procedure. Cystic liquid is then withdrawn, and decrease in cyst volume documented by imaging. Where cysts develop at more than one spinal level, more than one aspiration procedure may be needed.

### ***Efficacy***

In the context of benign cystic disease within the spine, the treatment intent is relief of symptoms.

No controlled trials (e.g. against open surgery) were available comparing the efficacy of image-guided percutaneous cyst aspiration with other treatment options, as a means to improve symptoms.

The volume of liquid aspirated from cysts varied between 1ml and 30ml in one report of three patients<sup>1</sup>. In other studies where this outcome was reported 8ml<sup>2</sup> and 10ml<sup>3</sup> of aspirate were taken.

In once case series of patients with sacral perineural cysts two out of three patients achieved pain relief for up to three weeks, and in a third patient pain relief was achieved on the 2<sup>nd</sup> postoperative day and lasted for several

weeks<sup>1</sup>. Reports of two patients (one with an arachnoid cyst<sup>3</sup>, and one with spinal hydatid cysts<sup>2</sup>) reported that image guided aspiration rendered patients asymptomatic during follow-up of one year. One case report of a patients with symptomatic Tarlov cyst reported that aspiration produced immediate pain relief, however pain recurred on the 5th day of follow-up and the patient underwent open decompression<sup>4</sup>.

Where follow-up imaging of cysts was undertaken, one patient demonstrated a collapsed spinal cyst and spinal cord decompression an MRI at four months follow up<sup>2</sup>. Conversely, in a report of three patients an increase in cyst diameter was documented in one patient on MRI at three months follow up. In this group regrowth of cysts eventually occurred in all three patients, who were subsequently treated operatively<sup>1</sup>.

## ***Safety***

Only one case report provided details of the safety of this procedure.

One case report of a patient with spinal hydatid cysts which were aspirated under CT guidance reported that the patient tolerated the procedure well with no allergy or anaphylaxis.<sup>2</sup>

## **Literature review**

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

The medical literature was searched to identify studies and reviews relevant to percutaneous image guided aspiration of central nervous system cysts. Searches were conducted via the following databases, covering the period from their commencement to 23/11/06: 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**

<b>Characteristic</b>	<b>Criteria</b>
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 cysts within spinal cysts.
Intervention/test	Percutaneous aspiration with image guidance (any form)
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 four case reports<sup>1,3,2,4</sup> of seven patients.

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***

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:**

None

#### **Technology appraisals:**

None

#### **Clinical guidelines:**

None

#### **Public health:**

None

**Table 2 Summary of key efficacy and safety findings on percutaneous image guided aspiration of spinal cysts.**

Abbreviations used: CT - computed tomography,			
Study details	Key efficacy findings	Key safety findings	Comments
<p>Lee J Y (2004)<sup>1</sup></p> <p><b>Case reports</b></p> <p>Germany</p> <p>Study period: not stated</p> <p><b>n = 3</b></p> <p>Population: Male = 0%, Age = 35 years.</p> <p>Indications: Patients with sacral perineural cysts, causing sciatic pain</p> <p>Technique: Under local anaesthesia 18 to 22G needle inserted into the cysts using thin section (2mm) high resolution CT guidance.</p> <p><b>Follow-up = Not stated</b></p> <p>Conflict of Interest: not stated</p>	<p><b>Operative parameters</b> Between 1ml and 30ml of clear cystic liquid were taken from the patients.</p> <p>In one patient (1/3) histological evaluation was not possible as the specimen recovered was too small and showed artificial changes due to bipolar coagulation.</p> <p><b>Clinical benefit</b> Immediately after the procedure, the cysts collapsed completely in all 3 patients.</p> <p>Pain relief was achieved in 2 out of 3 patients for 3 days to 2 weeks. In 1 patient headache occurred immediately following aspiration but pain relief was achieved on the 2<sup>nd</sup> day of follow up and lasted for several weeks.</p> <p><b>Cyst regrowth</b> In one case an increase in cyst diameter was seen at 3 months on MRI scans.</p> <p>Regrowth of cysts occurred in all cases, 2 were treated operatively and 1 had surgery planned.</p>	<p>Not reported.</p>	<p>No details given of patient selection criteria.</p> <p>Patients went on to receive operative removal of recurrent cysts. Therefore long term follow up not possible.</p> <p>No details provided of operator experience.</p> <p>No details provided of method of assessment of pain relief outcomes</p> <p>Some variation in aspiration process.</p>

Abbreviations used: CT - computed tomography,			
Study details	Key efficacy findings	Key safety findings	Comments
<p>Bellavia R (2000)<sup>3</sup></p> <p><b>Case report</b></p> <p>USA</p> <p>Study period: Not stated</p> <p><b>n = 1</b></p> <p>Population: Male = 0%, Age = 47 years. Cyst diameter = 3cm</p> <p>Indications: patient with an arachnoid cyst with intra and extradural components in the lower thoracic spine. Symptoms of residual back pain being controlled by NSAIDs</p> <p>Technique: Under local anaesthesia a 22G needle was inserted into the cysts using MRI guidance with and in room monitor with near in-time display.</p> <p><b>Follow-up = 1 year</b></p> <p>Conflict of Interest: Not stated</p>	<p><b>Operative parameters</b> 10ml of clear fluid was aspirated, without resistance. Two needle passes were performed.</p> <p>The cyst was noted to partially decompress, but was not drained to the point of total evacuation.</p> <p>Laboratory analysis of aspirate confirmed it to be cerebrospinal fluid consistent with the diagnosis of an arachnoid cyst. The sample analysis was negative for malignancy.</p> <p>Operative time was 21 minutes, and the patient was discharged after 2 hours of observation.</p> <p><b>Clinical benefit</b> The patient was followed up for 1 year without recurrence of symptoms.</p>	<p>Not reported</p>	<p>Patient had previously undergone a right hemi-laminotomy and discectomy at L4 for radicular pain.</p> <p>Method of case selection or accrual of patients not stated</p> <p>Quantitative assessment of change in clinical outcomes was not undertaken.</p> <p>Difficult to determine whether there were no complications, or whether they were not reported on.</p> <p>Operator experience is not stated.</p> <p>Authors state that careful patient selection is necessary for percutaneous sampling to exclude lesions where the risk of haemorrhage is high</p>

Abbreviations used: CT - computed tomography,			
Study details	Key efficacy findings	Key safety findings	Comments
<p>Spektor S (1997)<sup>2</sup></p> <p><b>Case report</b></p> <p>Israel</p> <p>Study period: not stated</p> <p><b>n = 1</b></p> <p>Population: Male = 100%, Age = 50 years. A large multilocular spinal hydatid cyst at C2-3 which extended extradurally into the spinal canal, causing severe spinal cord compression.</p> <p>Indications: Patient with advanced stage echinococcosis with liver and spinal hydatid cysts. Admitted to emergency room with progressive quadroparesis.</p> <p>Technique: Under local anaesthesia a 19G needle was inserted into the cyst using CT guidance, after aspiration the cyst was irrigated with a mixture of 3% sodium chloride and a contrast medium, and subsequently evacuated. The procedure was repeated at a second level.</p> <p><b>Follow-up = 1 year</b></p> <p>Conflict of Interest: not stated</p>	<p><b>Operative parameters</b> 8ml of transparent fluid with 'hydatid sand' was aspirated.</p> <p>A 'fair collapse' of intra-canal cysts and spinal cord decompression were achieved.</p> <p>Evaluation of cystic fluid confirmed Echinococcus granulosus.</p> <p><b>Clinical benefit</b> Several minutes after cyst decompression the patient started to move his extremities. At 1 day FU the patient was able to lift their arms, and at 2 days they were able to walk (assistance required not stated).</p> <p>The patient was discharged on the 5<sup>th</sup> postoperative day with neurological disorders 'almost completely resolved'.</p> <p>At 2 months follow up neurological examination found slight residual paralysis of the right arm, but the patients was independent in his daily activities.</p> <p>MRI at 4 months FU demonstrated collapse of spinal cysts and the absence of spinal cord compression.</p> <p>At 1 year follow up the patient was asymptomatic.</p>	<p><b>Complications</b> The patient tolerated the procedure well with no allergy or anaphylaxis</p>	<p>It was not clear if this was the first case managed with this intervention at the institution in question.</p> <p>Concomitant medical therapy was also employed, making attribution of outcomes to the aspiration intervention uncertain.</p> <p>Patient had previously undergone resection of a hepatic echinococcal cyst.</p> <p>Quantitative assessment of change in clinical outcomes was not undertaken.</p>

Abbreviations used: CT - computed tomography,			
Study details	Key efficacy findings	Key safety findings	Comments
<p>Landers J (2002)<sup>4</sup></p> <p><b>Case report</b></p> <p>Australia</p> <p>Study period: not stated</p> <p><b>n = 1</b></p> <p>Population: Male = 0%, Age = 74 years. CT scan demonstrated presence of multiple lesions within the sacral canal and thinning of the overlying sacral laminae. MRI showed lesions to be fluid filled cysts causing displacement of the right SI nerve root.</p> <p>Indications: Patient with a symptomatic Tarlov cyst, with 2 month history of dull right sciatic pain which had become severe and extended to the groin in the week prior to admission. Pain was refractory to analgesia.</p> <p>Technique: Needle drainage under CT guidance (no further details provided).</p> <p><b>Follow-up = 5 days</b></p> <p>Conflict of Interest: not stated</p>	<p><b>Clinical benefit</b></p> <p>Following aspiration there was immediate resolution of pain, and the patient was discharged.</p> <p>Pain returned on the 5<sup>th</sup> day of follow up, and the patient was treated by open decompression of the symptomatic cyst.</p>	<p>Not reported</p>	<p>Due to comorbidity the patient was taking clopidogrel which influenced the decision to undertake percutaneous drainage.</p> <p>Method of case selection for presentation was not stated. It was not clear if this was the first case managed with this intervention at the institution in question.</p> <p>Further follow up is reported following the open procedure necessary following pain recurrence but this is not extracted here</p>



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

- Volume of aspirate removed varied between studies. In some cases it appears that total drainage was not intended.
- Very little quantitative evaluation of efficacy has been performed in clinical studies to date.

### **Specialist advisers' opinions**

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

Mr L Dunn, Mr B Mathew, Dr A Gholkar, Dr A Molyneux.

- The procedure was considered to be a minor variation on an existing procedure which is unlikely to alter its efficacy and safety profile, or otherwise as established practice. It is a commonly used procedure for spine lesions outside the dura.
- Theoretical adverse events relating to the procedure may include bleeding, infection, or nerve / spinal cord damage including paraplegia, and cyst recurrence.
- The procedure would be conducted only by experienced spinal interventionists, neurosurgeons or neuroradiologists.
- The main comparator would be open cyst aspiration, or laminectomy / hemi-laminectomy. The uncertainty with regard to this procedure is whether the potential for neurological damage outweighs the advantage of undergoing a procedure requiring only a local anaesthetic.
- Appropriate imaging facilities are required to undertake this procedure.
- Diffusion of this procedure if considered safe and efficacious is likely to be slow due to the relatively uncommon indication, three advisers it would probably be used in a minority of UK hospitals but at least 10. While the other thought its use would be limited to fewer than 10 specialist centres.

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

- Image guided aspiration has been used to treat cysts with a range of aetiologies.
- The committee may wish to consider separately the use of aspiration in the context of sudden onset of neurological symptoms, or for chronic radicular pain.

## References

- 1 Lee J-Y, Impekoven P, Stenzel W et al. (2004) CT-guided percutaneous aspiration of Tarlov cyst as a useful diagnostic procedure prior to operative intervention. *Acta Neurochirurgica* 146: 667-670.
- 2 Spektor S, Gomori JM, Beni-Adani L et al. (1997) Spinal echinococcal cyst: treatment using computerized tomography-guided needle aspiration and hypertonic saline irrigation. Case report. *Journal of Neurosurgery* 87: 464-467.
- 3 Bellavia R, King JT, Jr., Naheedy MH et al. (2000) Percutaneous aspiration of an intradural/extradural thoracic arachnoid cyst: use of MR imaging guidance. *Journal of Vascular & Interventional Radiology* 11: 369-372.
- 4 Landers J and Seex K. (2002) Sacral perineural cysts: Imaging and treatment options. *British Journal of Neurosurgery* 16: 182-185.

## Appendix A: Additional papers on percutaneous image guided aspiration of spinal cysts 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/ follow-up	Direction of conclusions	Reasons for non-inclusion in Table 2
None applicable			

## Appendix B: Related published NICE guidance for percutaneous image guided aspiration of spinal cysts.

<b>Guidance programme</b>	<b>Recommendation</b>
Interventional procedures	None applicable
Technology appraisals	None applicable
Clinical guidelines	None applicable
Public health	None applicable

## Appendix C: Literature search for percutaneous image guided aspiration of spinal cysts

IP: 384 Percutaneous image guided aspiration of central nervous system cysts		
Database	Date searched	Version searched
Cochrane Library	23/11/06	2006, Issue 4
CRD databases (DARE & HTA)	23/11/06	2006, Issue 4
Embase	23/11/06	1980 to 2006 Week 46
Medline	23/11/06	1966 to November Week 3 2006
Premedline	23/11/06	November 22, 2006
CINAHL	23/11/06	1982 to November Week 3 2006
British Library Inside Conferences	23/11/06	-
NRR	23/11/06	2006 Issue 4
Controlled Trials Registry	23/11/06	-

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

1	exp Biopsy, Fine-Needle/	2055
2	biopsy, needle/	36301
3	Spinal Puncture/	3779
4	Drainage/	25844
5	Suction/	8199
6	aspirat\$.tw.	53768
7	fna.tw.	3572
8	(percutaneous adj3 (drain\$ or puncture\$ or suction\$)).tw.	4484
9	(needle adj3 (fine or skinny or thin)).tw.	16020
10	or/1-8	112871

11	exp Tomography, X-Ray Computed/	184503
12	(comput\$ adj3 tomograph\$).tw.	106315
13	Ultrasonography/	54816
14	(ultraso\$ or sonograph\$).tw.	167840
15	flouroscopt\$.tw.	22
16	exp Magnetic Resonance Imaging/	165109
17	mri.tw.	64931
18	(therm\$ adj map\$).tw.	100
19	(magnetic adj3 resonance).tw.	110831
20	(mr adj3 (guid\$ or imag\$)).tw.	28764
21	or/11-20	547645
22	10 and 21	21491
23	exp Central Nervous System/	794658
24	exp Brain/	720668
25	exp Spinal Cord/	62959
26	(central adj3 nervous).tw.	91669
27	brain.tw.	428592
28	(spinal adj3 cord).tw.	71179
29	exp Cerebrospinal Fluid/	11504
30	(cerebrospinal adj3 fluid).tw.	43498
31	or/23-30	1055853
32	cyst\$.tw.	204350
33	exp Arachnoid Cysts/	1115
34	Echinococcosis/	6884
35	or/32-34	207979
36	31 and 35	14972
37	22 and 36	231
38	animals/	4163880
39	humans/	9958560
40	38 not (38 and 39)	3147770
41	37 not 40	229