

## ORIGINAL ARTICLES

## Acute Paediatric Neck Abscesses

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## Abstract

Acute neck swellings in a paediatric setting are often treated with antibiotics, proceeding to incision and drainage if an abscess is suspected. A variety of investigations are available and the causative organism can vary. A five-year retrospective study analysing trends in microbiology, antibiotic sensitivity, clinical evaluation and management of children presenting with an acute cervical abscess of four weeks duration or less was performed.

The case notes of 175 children admitted between January 1996 and December 2000 to the acute surgical admission unit at the Royal Hospital of Sick Children, Glasgow were studied.

During this period there were 90 males and 85 females with a mean age of three years (range: one month to 13 years). One hundred and twenty three (70%) children underwent surgery with pus being confirmed in 114 (93%) of cases. Ultrasound was performed in 70 (40%) patients with 48 proceeding to surgery. Positive culture of pus from abscess cavities revealed *Staphylococcus aureus* in 46% (85% sensitive to both flucloxacillin and erythromycin) and *Streptococcus pyogenes* in 15% (80% sensitive to penicillin and 75% to erythromycin).

The role of investigations and the available treatment options are discussed.

## Introduction

Acute cervical lymphadenopathy is common in children. Appropriate management includes careful history and clinical examination, investigations such as ultrasound scan (USS) and treatment, followed by identification of any underlying predisposing factors. Most cases are treated medically in the first instance; nevertheless some cases present as focal sepsis with abscess formation, which may require surgical drainage.<sup>1</sup>

The aims of this study were to establish whether there were specific investigations that could be useful in predicting the presence of an abscess cavity, to characterise the microbiology and antibiotic sensitivity of these infections and to establish the complication rate of any surgical intervention.

## Patients and Methods

A review was undertaken of the case notes of all children (aged 16 or less) admitted to the acute surgical receiving ward at the Royal Hospital for Sick Children in Glasgow between January 1996 and December 2000, who presented with an acute cervical swelling palpable in the anterior or posterior triangles of the neck. Mastoid abscesses, dental abscesses and postoperative infections, together with patients whose history was greater than four weeks were excluded. In addition to this, deep neck space infection such as parapharyngeal, retropharyngeal and prevertebral abscesses were excluded.

Information was gathered on patient characteristics of age, sex, admitting specialty, clinical examination and treatment received. The results of investigations such as white blood count (WBC), fine needle aspirate (FNA), biopsy, radiological assessment and bacterial culture and sensitivities were recorded, in addition to antibiotics administered peri-operatively, their length of administration, antibiotic change and penicillin allergy.

Operative data included timing of operation, history of previous surgery and presence of pus at incision. Abscess resolution, recurrence and any complications were also noted.

## Results and Analysis

One hundred and seventy five case notes were reviewed. The mean age was three years (range: one month to 13 years); sex was equally distributed between 85 girls (49%) and 90 boys (51%). Seventy percent of patients proceeded to incision and drainage. (Table I) The average age of children proceeding to incision and drainage was significantly younger than those receiving antibiotics alone  $p < 0.0001$  ( $\chi^2 = 29.2$ ,  $DF = 1$ ).

The overall average admission length was four days (range one to 14 days). The patients were admitted to general surgery in 128 cases (73.1%), ear nose and throat (ENT) surgery in 46 cases (26.3%) and one patient (0.6%) was admitted to the care of maxillo-facial surgeons.

Table I: Age and Management (Age difference  $P < 0.0001$ )

	Incision and drainage	Medical Management
Patient number	123	52
Percentage	70%	30%
Average Age	2 years 4 Months	4 years 5 Months

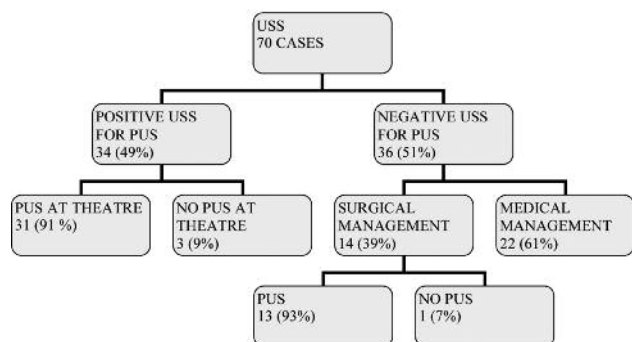
Seventy eight (45%) were on the right side of the neck, 70(40%) on the left, 19(11%) in the midline, 6(3%) bilateral and 2(1%) in the occipital area. Of the above, 145(83%) were in the anterior triangle of the neck, 28 (16%) were in the posterior triangle of the neck and two (1%) were in the occipital area.

### Investigations

Routine WBC was recorded in 85 patients. The WBC was found to have a wide distribution and there was no correlation in the level of WBC and the presence of pus found at incision and drainage.

Seventy patients underwent ultrasound examination (USS). (Fig1.) The sensitivity of USS was 70%, but it had a specificity of only 25%. A chest x-ray was requested in eight cases, a computed tomography scan in five, a soft tissue x-ray of the neck in one and an x-ray of the mandible in one.

Figure I: Result of Ultrasound Scanning (USS)



Needle aspiration was performed in 17 cases, 11 of which produced pus and eight of the 11 patients proceeded to surgery.

One hundred and twenty three patients underwent surgery. Eighty six percent of these had a mass described by the clinician as being fluctuant. Pus was obtained in 114 (93%) whilst in nine (7%) no pus was found. During surgery 16 patients had a biopsy taken, which confirmed inflammation in eight cases, pus only in five, and one case each of acid-fast bacilli, atypical mycobacteria and granulation tissue.

### Antibiotic practice

The antibiotics prescribed during the pre-admission, pre-operative and post-operative periods are shown in Table II. Four patients of all the 175 cases were allergic to penicillin. There was a change in the antibiotic given in 57 patients (33%).

No bacteriology specimen was sent in 71 patients and in the remaining 104 patients pus specimens were obtained from needle aspirates or at surgery. The most common pathogen was *Staphylococcus aureus* in 48 cases (46%), *Streptococcus pyogenes* in 16 cases (15%) and no growth in 37 cases (36%). The remaining pathogens are detailed in Table III.

The antibiotic sensitivities of the commonest pathogens, *Staphylococcus aureus* and *Streptococcus pyogenes* are shown in Tables IV and V.

### Outcomes

The mean length of stay in hospital was four days with a range of one to 14 days. Recurrence occurred in 16 patients.

Table II: Antibiotic Practice

Antibiotics	Pre Admission	In Hospital
Number of Patients	175	175
Co-amoxiclav	28	76
Flucloxacillin	18	22
Erythromycin	8	6
Penicillin	17	6
Amoxicillin	14	1
Cephalosporin	2	0
Ampicillin	1	0
Azithromycin	1	0
Clindamycin	0	1
Ceftriaxone	0	1
Mean length of treatment (days)	5	7

Table III: Microbiology Results

None taken	71	Strep constellatus	1
Staph aureus	48	Haem influenzae	1
No growth	37	MRSA	1
Strep pyogenes	16	Atypical mycobacteria	1
Strep pneumonia	2	Mycobacteria TB	1

Table IV: Number of Sensitivities to *Staphylococcus aureus*

Sensitive		Resistant	
Flucloxacillin	43	Benzylpenicillin	41
Co-amoxiclav	11		
Erythromycin	42		
Fucidic acid	2		
Cefotaxime	1		

Table V: Number of Sensitivities to *Streptococcus pyogenes*

Sensitive		Resistant	
Benzylpenicillin	13	Benzylpenicillin	2
Erythromycin	12		
Co-amoxiclav	2		
Ampicillin	2		

Complications occurred in 33 patients as shown in Table VI.

In 19 cases an underlying condition was established. (Table VII)

Table VI: Complications

Recurrence	24	Peri-op seizure	1
Wound granulation	2	Hypertrophic scar	1
Wound infection	2	Sinus	1
Maculo-papular rash	1	Marginal mandibular nerve palsy	1

Table VII: Underlying Condition

Thyroglossal cyst	6	Multiple congenital defects	1
Chronic granulomatous disease	3	Cystic hygroma	1
Branchial cyst	2	Lymphangioma	1
Multiple site abscesses	2	Collaural fistula	1
Atypical mycobacteria	1	Stage IV neuroblastoma	1

## Discussion

When a child presents with an acute neck lump a clinical decision is made on whether this is an infective lymphadenitis, or less commonly, a neoplastic process. Once a diagnosis of cervical lymphadenitis is made, the next diagnostic challenge is to decide whether the cervical node has undergone suppuration and abscess formation. This decision is usually dependent on clinical examination. A child with a fluctuant tender cervical node with skin erythema and pyrexia not responding to antibiotic therapy would suggest suppuration. This decision may be reinforced by the results of a variety of investigations. In general, suppurative lymphadenitis would require a drainage procedure.

All the patients in our study were diagnosed as having an acute infective process requiring admission to hospital for further management. In conjunction with history taking, the observation of clinical fluctuation of the swelling was found to be one of the strongest indicators for correctly proceeding to surgery. Clinical history and regular evaluation are therefore of paramount importance in this rapidly changing clinical scenario. However, fluctuation itself is difficult to assess on occasion and an abscess under pressure may seem firm on palpation.

It is worth noting that in our population, younger patients tended to proceed more commonly to incision and drainage and this was found to be statistically significant. The reason for this is unclear. This may be due to them having a relatively immature immune system, or that they have had a more limited exposure to pathogenic bacteria. More investigation into this may be warranted.

Within our study population there was considerable variation in practice. Referrals were made to various surgical specialties, and primary care physicians prescribed an array of various antibiotics prior to hospital admission.

Several investigative modalities were used. Imaging studies seem to be particularly dependent on timing, as lymphadenopathy may proceed to rapid abscess formation. The use of ultrasound as guidance for abscess formation has been reported as a sound indicator for incision and drainage.<sup>2</sup> In our experience, access to ultrasound is not always available

at the time of request, or it may be performed too early in the process of abscess formation. In addition, in our series, USS was not a particularly sensitive or specific investigation. Despite negative ultrasound, 39% of children proceeded to incision and drainage on clinical grounds and in 93%, this resulted in the drainage of a collection.

Radiological imaging such as computed tomography (CT) or magnetic resonance imaging (MRI) has a limited role in the first line diagnosis of a cervical abscess in the anterior or posterior triangles with CT scanning being unhelpful in differentiating abscess from lymphadenitis, cellulites and complex cervical masses.<sup>3,4</sup> The practicalities of imaging must also be taken into consideration. Young children may require general anaesthesia in order to obtain adequate images; they are also likely to be reluctant to allow an ultrasound probe to pass over a painful abscess or lymph node.

FNA is a procedure which may be diagnostic and therapeutic at the same time.<sup>5</sup> Successful ultrasound guided percutaneous catheter drainage of deep neck abscesses can be performed<sup>6</sup> and needle aspiration may be beneficial in draining small abscess cavities with surgical drainage being only rarely necessary according to Lane.<sup>7</sup>

In our series those children who had an FNA still proceeded to surgical drainage, so it was felt that this was more a diagnostic tool rather than treatment. In our experience the majority of children, particularly in younger age groups, will not tolerate this intervention.

In a significant number of cases there was no growth of organisms in the microbiology specimens. This is likely to be secondary to the child already receiving antibiotics prior to hospitalisation (all patients had received antibiotics before presentation). Other reasons may include the presence of more unusual organisms such as atypical mycobacteria (found increasingly in our paediatric population) which are not normally cultured unless specifically requested. It is disappointing that incision and drainage procedures did not always result in the submission of a bacteriology swab for culture and sensitivity, the results of which could aid in the choice of antibiotic cover in difficult cases. The positive results of culture and sensitivity are similar to previous studies with *Staphylococcus* and *Streptococcus* being most common. Hawkins and Austin<sup>8</sup> in the United States of America reviewed 112 patients five years of age and younger, culturing *Staphylococcus aureus* in 39% and beta-haemolytic *Streptococcus* in 17%, comparing very closely with the results in this study of 46% and 15% respectively. Wright reports penicillin-resistant *Staphylococcus* to be the most common pathogen in Australia.<sup>9</sup> The wide variety of antibiotics administered prior to admission in this study does not seem to be merited in the light of the pathogens actually cultured and the expense of some of the antibiotics involved.

Recurrence occurred in 24 patients and in this situation an underlying abnormality should be considered. These include thyroglossal duct cysts and branchial arch anomalies. Complications are uncommon but there was one marginal mandibular nerve paralysis in this series which was very significant for the child affected. Particular care should be taken when incising and draining an abscess adjacent to the angle of the mandible.

## Conclusions

- Younger children are more likely to present with a suppurative neck mass requiring incision and drainage.
- Blood tests are not helpful.
- Ultrasound may assist in the determining if a mass is solid or has an area of liquefaction.
- Regular clinical examination to assess the patient's general condition and relative fluctuation of a neck swelling are the best means of assessing whether an abscess has formed and requires surgical drainage.
- A specimen should be submitted to bacteriology with specific comments if unusual organisms are suspected.
- There is no uniformity of antibiotic use. From culture and sensitivity results, first line antibiotic choice in our population is a combination of flucloxacillin with penicillin, or co-amoxiclav alone, alternatively using erythromycin in penicillin allergy.
- Beware an underlying congenital anomaly in recurrent infection.

## Note

This paper was originally presented to the British Association of Paediatric Otorhinolaryngology.

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