*The Journal of Laryngology & Otology*
December 2004, Vol. **118,** pp. 919–926

# Review Articles

# Paediatric retropharyngeal abscess

C. M. PHILPOTT, D. SELVADURAI, A. R. BANERJEE

**Abstract**
Retropharyngeal abscess (RPA) is an uncommon condition with the potential for significant morbidity and mortality if not detected early. The authors present a case report of a 19-month-old child who presented with the common clinical features of a retropharyngeal abscess and in whom the diagnosis was not established by examination and ultrasonography. This led to a delay in appropriate management until a computed tomography (CT) scan was performed under general anaesthesia. The scan demonstrated the diagnosis and surgical drainage was performed under the same anaesthetic. The child subsequently made a complete recovery. The investigation and treatment of RPAs is a matter of some debate and the authors review the recent literature to determine the best management strategy.

**Key words: Retropharyngeal Abscess; Child**

## Introduction

Retropharyngeal abscesses (RPAs) have become less frequent since the introduction of antibiotics. Although rare,[1,2] they are a serious condition with the potential for significant morbidity and mortality if not detected early.[3–5] They account for 12–22 per cent of all deep space infections in the neck[6,7] and the peak incidence in children is at three to five years of age.[8] The clinical assessment of young children and infants provides a greater challenge in establishing a diagnosis. Their aetiology and presentation can vary from that of their adult counterparts and their investigation and management may need a different approach to avoid potential pitfalls.

Retropharyngeal abscesses fall into the group of deep space infections of the neck, which include parapharyngeal abscesses and Ludwig's angina and multiple abscess types can sometimes co-exist.[9,10] This review will address RPAs in children.

## Case report

A 19-month-old child presented to the Department of Paediatrics with a swinging fever and irritability. The parents reported that the child was pulling at his throat and ears and had some neck stiffness. The child was also reported to be drooling and was lethargic, with mild photophobia. There was no significant past medical history. Examination demonstrated red inflamed tonsils and a pyrexia of 39ºC. A provisional diagnosis of tonsillitis was made and the patient started on intravenous benzyl penicillin. A full blood count showed a marked leucocytosis with a white cell count of 35.8 $10^9$/l. Following a review by a paediatric consultant, it was noted that the child had significant cervical lymphadenopathy. Due to the neck stiffness and pyrexia, a lumbar puncture was performed. This was subsequently found to be negative. The following day the patient was referred to the paediatric surgeons to investigate the possibility of an abscess in one of the submandibular lymph nodes. Following review by a paediatric surgeon who felt there was no abscess, the patient was left in the care of the paediatricians who subsequently arranged an ultrasound scan of the neck that merely confirmed the presence of multiple enlarged cervical lymph nodes.

Four days after admission, an ENT opinion was requested as the child's condition had deteriorated. At this time torticollis and an increasing dysphagia were noted and the oropharynx was thought to be normal. Due to the clinical suspicion of an RPA, a computed tomography (CT) scan was requested and as this would necessitate a general anaesthetic, provision was made to proceed to the operating-theatre directly from the radiology department if an

From the Department of Otorhinolaryngology, Leicester Royal Infirmary, University Hospitals of Leicester NHS Trust, Leicester, UK.
Accepted for publication 21 June 2004.

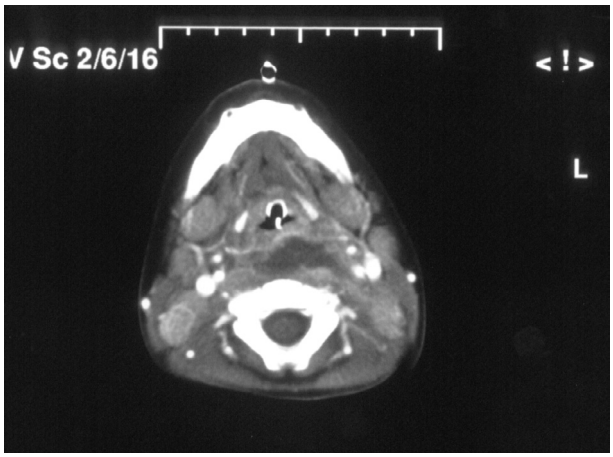


FIG. 1
CT image at level of epiglottis showing RPA.

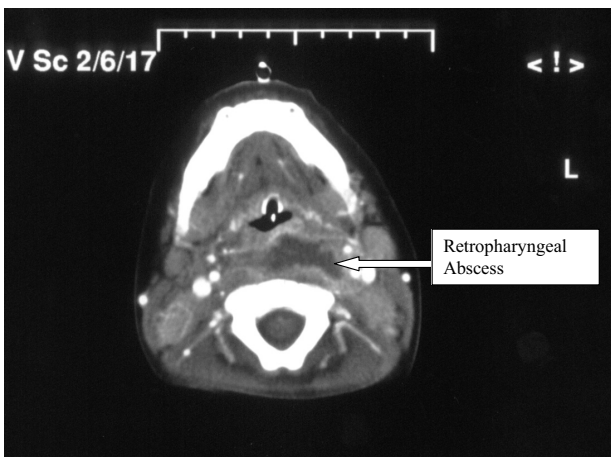


FIG. 2
Sequential CT slice with ring enhancing abscess shown.

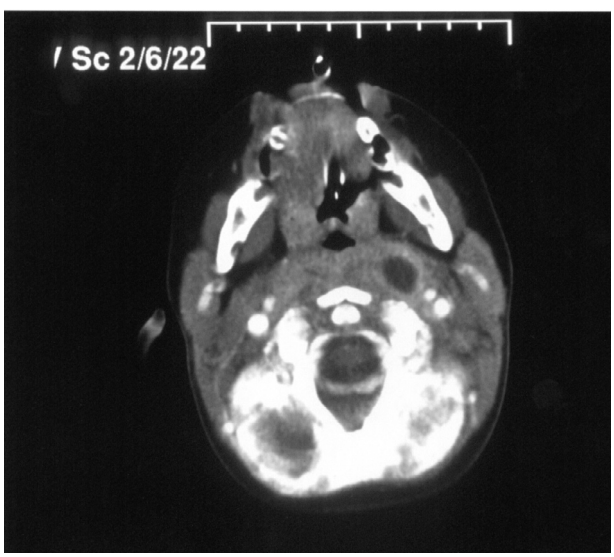


FIG. 3
Further sequential CT slice showing inferior extent of lesion.

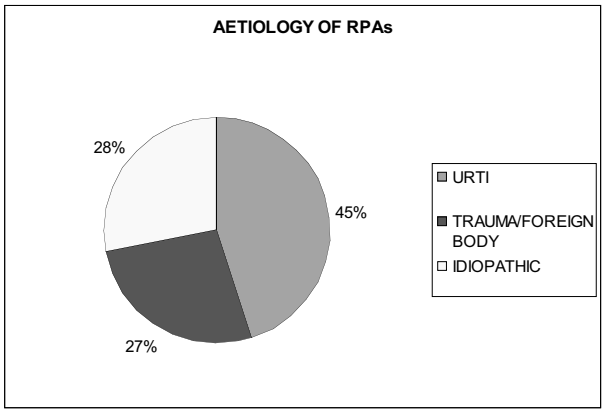


FIG. 4
Aetiology of retropharyngeal abscesses.

abscess was demonstrated. A retropharyngeal abscess was seen on the CT scan (Figures 1–3) and was drained transorally in the operating-theatre. The child recovered uneventfully on the ward with i.v. antibiotics.

From this sequence of events it is evident that the important finding of a high leucocytosis was ignored and that the use of ultrasonography and penicillin were suboptimal management choices in a child where a serious condition should have been suspected from the outset. These errors are most likely due to the absence of retropharyngeal abscess from the differential diagnosis.

## Anatomy

The retropharyngeal space is a potential space immediately anterior to the prevertebral fascia that continues inferiorly from the skull base for the length of the pharynx.[11] It is continuous laterally with the potential space at the side of the pharynx known as the parapharyngeal space, which in turn is continuous with the infratemporal fossa superiorly. The retro- and parapharyngeal spaces are separated by the alar fascia[12] although this appears to be an ineffectual barrier to the spread of infection. The continuation of the retropharyngeal space into the superior and posterior mediastinum explains its importance as a potential pathway for spread of infection into the chest.

Anterior to the retropharyngeal space lie the constrictor muscles of the pharynx and their associated fascia and laterally are the carotid sheaths. The space contains loose areolar tissue and lymphatic chains, the former allowing movement of the pharynx and oesophagus on swallowing. The lymph flowing through the space originates from tissues in the nose, paranasal sinuses and eustachian tubes down to the adjacent pharyngeal tissues.[13] The reduced incidence of RPAs in children over four years of age appears to be due to the regression of the retropharyngeal lymph nodes.[10,14–16] Suppuration in these nodes is often well contained and therefore vertical spread of infection can occur late in the progression of the condition, although this rarely occurs in practice.

https://doi.org/10.1258/0022215042790538 Published online by Cambridge University Press

TABLE I

BACTERIOLOGY OF RETROPHARYNGEAL ABSCESSES

| Organism | Approximate incidence (%) |
|---|---|
| *Streptococcus viridans* | 39–41 |
| *Staphylococcus aureus* | 18–26 |
| *Staphylococcus epidermidis* | 22 |
| β-haemolytic streptococci | 8–18 |
| *Veillionella* spp | 14 |
| *Bacteroides melaninogenicus* | 17 |
| *Haemophilus parainfluenzae* | 14 |
| *Klebsiella pneumoniae* | 13 |
| *Prevotella* spp | – |
| *Escherichia coli* | – |
| *Morganella* spp | – |
| *Enterobacter* spp | – |
| *Mycobacterium tuberculosis* | – |
| Mixed flora | 46 |

TABLE II

SYMPTOMS AND SIGNS OF RETROPHARYNGEAL ABSCESSES

| Symptom/sign | Approximate incidence (%) | More common in age < 1 year |
|---|---|---|
| Decreased oral intake | 92 | N |
| Neck pain (especially on movement)/torticollis | 89 | N |
| Odynophagia | 59–86 | N |
| Neck swelling/mass/ lymphadenopathy | 79–83 | Y |
| Pyrexia | 79–83 | Y |
| Dysphagia | 81 | Y |
| Anorexia | 81 | N |
| Drooling | 26 | N |
| Trismus | 18–19 | N |
| Dysphonia | 9 | N |
| Dyspnoea | 6 | N |
| Stridor | 19–31 | Y |
| Sleep apnoea syndrome | – | N |

## Aetiology

Retropharyngeal abscesses in children may be preceded by upper respiratory tract infection (e.g. pharyngitis / tonsillitis / sinusitis / cervical lymphadenitis) (45 per cent), or pharyngeal trauma / foreign body ingestion (27 per cent), but a substantial proportion appear to be idiopathic in their origin (Figure 4).[8,17,18]

## Bacteriology

The bacterial content of these abscesses is often a mixed flora and tends to represent pathological conversion of common upper respiratory tract commensals but common offending pathogens include *Streptococcus viridans*, *Staphylococcus aureus* and *epidermidis*, with other Gram positive bacteria and anaerobes also seen (Table I).

Variation in incidences between the various studies tends to suggest that the mixed floral abscesses are actually predominant.[5–7,19–27] A non-bacterial infection is very unusual, however, a recent case has been reported whereby Epstein-Barr virus (EBV) infection led to a retropharyngeal abscess formation and significant morbidity in a six-month old child.[28]

## Presentation

As with many conditions afflicting paediatric patients, especially in the younger ages, the symptom complex can be vague and varied, but significant symptoms include pyrexia, torticollis, and dysphagia (Table II).[2,3,9,21,29–33] Torticollis, especially, has been noted as an important clue by several authors of previous reports and was also present in this case.[34–39] Adequate clinical examination is required to ensure the correct diagnosis is at least suspected and then confirmed with the appropriate investigations, which are discussed below.[40] The symptom complex does not appear to differ when surgical drainage is not performed or the drainage is negative.[9] The most important factor is early diagnosis in order to prevent the significant morbidity that the condition can produce including airway obstruction and death.[33] The differential diagnosis should include acute epiglottitis, laryngotracheobronchitis and meningitis.

## Investigations

Haematological investigations may help provide evidence of infection and inflammation, e.g. FBC and ESR, but it is radiological investigations that provide the basis for confirming the diagnosis of a retropharyngeal abscess.

### *Plain radiography*

A lateral soft tissue film of the neck can provide a simple and useful aid to demonstrate the presence of an RPA. An increase in the soft tissue space anterior to the cervical spine with narrowing of the oropharyngeal airway (>7 mm at the level of the second cervical vertebra and >14 mm at the sixth are considered abnormal except in an expiratory film[41,42]) should lead to the suspicion of an abscess in the retropharyngeal space,[12,16,29,33,43,44] and some authors would advocate that sole reliance on this simple X-ray is sufficient.[18,20,30] Its specificity is reported as 100 per cent with a sensitivity of 80–88 per cent.[7,17,43] Dissenters of this method of radiological investigation are keen to point out that the prevertebral space can change with crying, swallowing, ventilation and flexion and extension of the neck;[45] it also will appear widened in other conditions such as myxoedematous thickening in the hypothyroid child and neoplastic swellings.[12]

### *Ultrasonography*

This case highlighted the inadequacy of ultrasonography for demonstrating the presence of an RPA. A negative result cannot therefore refute the presence of an RPA or other deep space abscess in the neck, but the investigation, if positive, can provide a simple, cheap and non-irradiating form of investigating the patient.[40,46,47] Some authors have presented it in a positive light in the context of RPAs,[48] even rating it above CT scanning[49] and this is simply due to its ability to distinguish fluid from solid. One study used colour Doppler ultrasonography to effectively confirm the diagnosis in a group of 50 patients.[50] Ultrasonography has not, however, proved the popular choice as one survey

https://doi.org/10.1258/0022215042790538 Published online by Cambridge University Press

conducted found that only 15 per cent of respondents find use for it even on an occasional basis.[51] This investigation should be utilized where appropriate but not considered final if clinical suspicions persist after a negative result.

*Computed tomography*

The appearance of an abscess on CT should be that of a homogenous area of hypodensity with ring enhancement when contrast is given. Cellulitis, on the other hand, should show up simply as soft tissue swelling with distorted fat planes.[52] This investigation is probably, to date, the gold standard for radiological investigation of an RPA.[8,20,45,51–54] There are, however, aspersions cast in some studies about the complete reliability of CT scans.[52] Two studies looked at the sensitivity and specificity of CT scans when used in a suspected RPA case. Boucher *et al.* and Stone *et al.* (both in 1999) determined that a CT scan had a specificity of 88 per cent and 45 per cent, with a sensitivity of 85 per cent and 100 per cent respectively.[43,55] Other studies have demonstrated similar findings.[33] The limitation of CT scans is in distinguishing cellulitis from an abscess,[43,56,57] a point commented on by Ungkanont *et al.* in 1995[7] (sensitivity 91 per cent, specificity 60 per cent). Necrotic nodes can also lead to a falsely positive scan result.[33] Complete reliance on CT scanning has resulted in unnecessary operations.[56] Choi and his colleagues found CT scanning a useful tool to place patients into one of four groups: cellulitis, RPA, parapharyngeal abscess (PPA) or concomitant RPA and PPA.[10] Nevertheless, they also found that 25 per cent of those who were categorized into abscess groups had no pus found at the time of surgical drainage. The size of the area of hypodensity on the CT scan has been assessed as a potential predictive marker for the likelihood of surgical drainage with volumes of greater than 2 $cm^3$ having a much greater chance of a positive result.[9] Another predictive marker was the irregularity of the abscess wall, as assessed by Kirse *et al.*, who suggested 'scalloping' as a late finding indicative of impending rupture.[8] Sichel suggested, albeit in relation to PPAs specifically, that the decision to operate should be based on the clinical picture including antibiotic responsiveness rather than CT findings alone.[56,58,59]

MRI scanning is rarely used for these abscesses in most centres but has the potential to delineate any complications more accurately, such as internal jugular vein thrombosis.[21]

## Management

*Medical*

Intravenous antibiotics are always the first line of treatment for any child suspected of having a retropharyngeal abscess. However, some authors would advocate the use of antibiotics solely without the need to reach for the scalpel.[60] This may be due to the perception that some abscesses are incorrectly diagnosed on CT scans and are in fact purely areas of cellulitis as discussed above.[61] Sichel *et al.* in 2002[62] presented a study of 12 patients with retropharyngeal abscesses of which seven (six children) who had no pus in any other potential spaces of the neck, were treated solely with i.v. co-amoxiclav for a period of between nine and 14 days. All seven patients were successfully treated and had no complications. Another group in 1994 to 1997 looked at deep space infections in 31 patients, (of which three were RPAs), and demonstrated the success of medical treatment in 90 per cent of cases with a mean duration in hospital stay of eight days per patient.[63] First line antibiotic choice may vary according to local preferences and microbiological advice but recommendations to cover Gram positive and anaerobic bacteria (and Gram negative and β-lactamase organisms) include:[7,23,24,51]

- Co-amoxiclav (good cover for upper respiratory tract organisms and anaerobes)
- Clindamycin + cefuroxime
- Ceftriaxone + metronidazole
- Gentamicin
- Ampicillin + Sulbactam

The initial choice of antibiotic(s) may later require alteration depending on the microbiological evidence of the causative organism. It may be prudent to obtain a microbiological sample by aspiration prior to commencement of antibiotics,[27] however the practical reality of this in young children is very limited.

*Surgical*

The authors of some studies would disagree about the recommended approach to the management of RPAs, as outlined above, raising the question of when surgical management is appropriate.[60,61] Because the complications of RPAs involve serious morbidity including airway obstruction, the importance of appropriate surgical intervention should always be borne in mind. Clinical suspicion should always take precedence, but common sense dictates that the decision to operate should always be taken in conjunction with the radiological evidence, be that plain X-ray, ultrasound or CT scan.

A large study of 73 patients demonstrated that surgical drainage was successful in 68 of the group, with almost all using the trans-oral approach.[8] Surgical drainage would also appear to be the preferred method of management by 83 per cent of all American paediatric otorhinolaryngologists.[51] A single incision and drainage may not always be adequate, as one study discovered; Coulthard *et al.* had a repeat drainage rate of 24 per cent,[17] although this appeared to be an unusual finding with figures of 10 per cent or less more common.[8] The preferred method of drainage appears to be the transoral approach[23] (95 per cent of cases[8]), using a Boyle-Davis gag to provide adequate exposure. Traditional external cervical approaches are frowned upon, especially in children, due to the potential for damage to important structures including the great vessels and cranial nerves VII, IX, X, XI and XII, but some centres still practise this technique routinely.[16,30] Indeed sometimes, an external

https://doi.org/10.1258/0022215042790538 Published online by Cambridge University Press

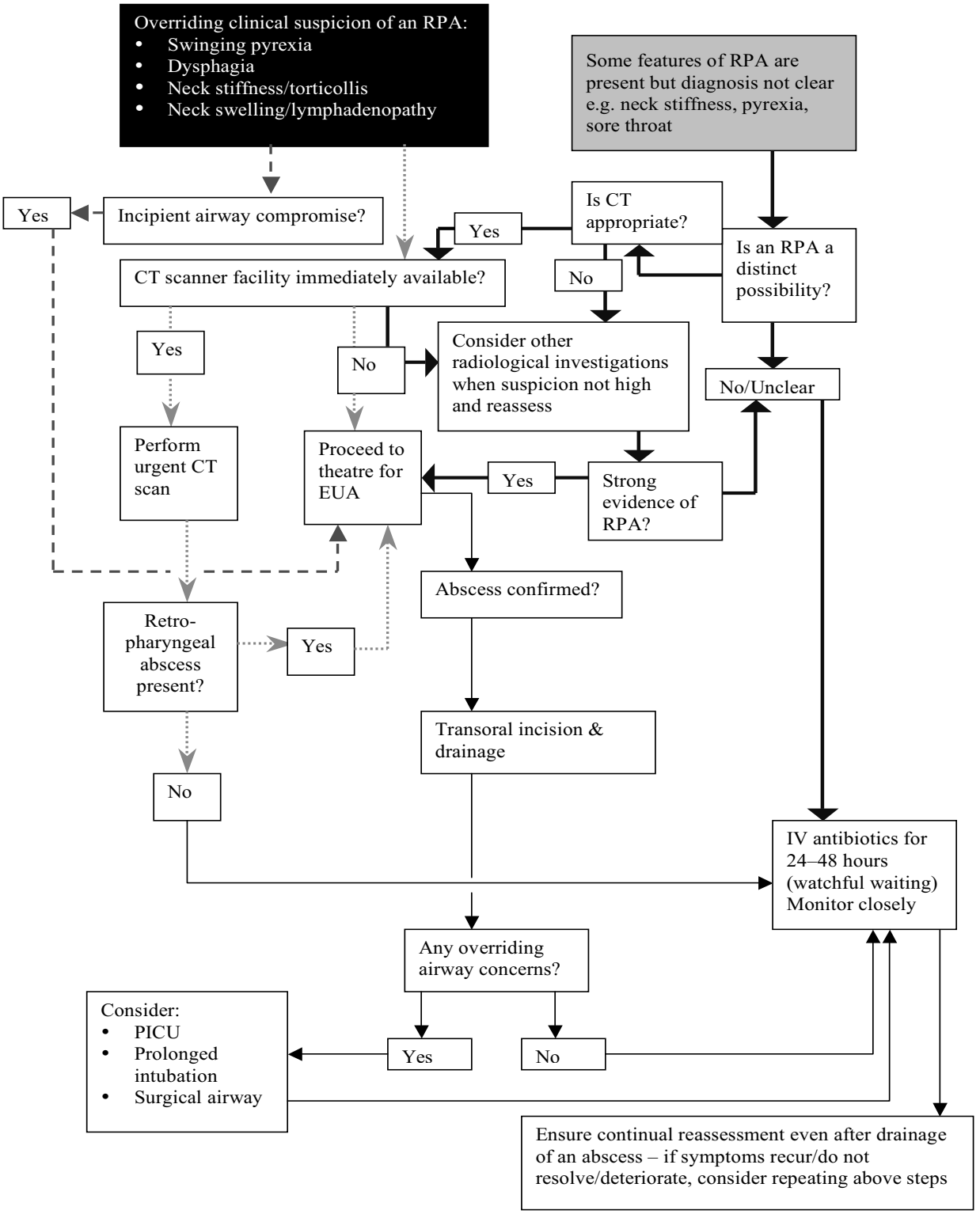


FIG. 5
Patients should be stratified into the following risk groups.

approach may be warranted for RPAs that extend laterally (i.e. with concomitant PPAs related to the carotid vessels).[27] Alternatives to direct surgical drainage have been demonstrated with the use of ultrasound-guided needle drainage having been evaluated in the USA relatively recently[64] and CT guided drainage in the last decade.[65,66]

Airway obstruction is always a very real concern, as one group discovered: 30 per cent of the children in a group of 39 with deep space neck infections suffered this problem.[33] In severe cases where the airway is at risk, tracheostomy may be required after drainage is performed[18,51] with, or without, post-operative ventilator support, although this

https://doi.org/10.1258/0022215042790538 Published online by Cambridge University Press

would appear to be a problem mostly found in adult patients and rarely needed in children.[5,7,16,30,67] Retaining the endotracheal tube for one to two days was practised in 25 per cent of patients in Kirse's study,[8] where the median age was found to be lower than the rest of the study group at 17 months. This practice was also popular in Lalakea's survey of paediatric otolaryngologists,[51] where 33 per cent of respondents used the measure for at least 10 per cent of patients, with 67 per cent of respondents indicating its necessity in five per cent or less of patients. Overall, the practice of prolonged intubation appears to be more commonplace than a surgical airway, with little evidence in the literature to show any necessity for tracheostomy in children.

- **Retropharyngeal abscess (RPA) is an uncommon condition with a potential for significant morbidity and mortality if not detected early**
- **Case of a 19-month-old child with clinical feature of a RPA in whom the diagnosis was not established by examination and ultrasonography**
- **A CT scan under general anaesthesia was performed and demonstrated the diagnosis**
- **The RPA was drained under the same anaesthetic and the child made a full recovery**
- **Best management strategy is reviewed**

## Complications

The incidence of these complications is rare, especially in children, but obviously they carry serious and significant morbidity:

(1) Recurrence of abscess (1–5 per cent)[7,9]
(2) Necrotizing fasciitis (mediastinitis)[68]
(3) Aspiration pneumonia (usually spontaneous rupture or inadequate drainage)
(4) Meningitis
(5) Epiglottitis
(6) Empyema
(7) Pyopneumothorax/pneumomediastinum[18]
(8) Purulent pericarditis

## Discussion

The management of retropharyngeal abscesses will remain an area of debate and development in otolaryngological circles, but whilst it remains an uncommon condition, correct diagnosis and evaluation remains crucial to ensuring this condition is adequately treated. Some patients may not present to ENT departments directly, as in this case example, and therefore early recognition of this condition by GPs and paediatricians is an important means of lowering associated morbidity. A sensible protocol for this condition based on the evidence presented above would be as follows:

(1) Commencement on appropriate antibiotics such as intravenous co-amoxiclav as soon as any suspicion is raised and the child is admitted to hospital.
(2) Clinical assessment of the child should enable risk stratification in terms of how likely an RPA is present – follow the flow chart (Figure 5). CT scanning is the ideal first step, but if not available, other radiological investigations can be considered where the clinical suspicion is not high enough to warrant an EUA. The use of a CT scan in children where the suspicion is not high will need to be a consultant decision, with the risks of anaesthesia considered if necessary. In some cases ultrasonography and plain radiography may be more appropriate where the suspicion is lower.
(3) Maintain an initial period of watchful waiting for 24–48 hours on intravenous antibiotics: if symptoms and signs are not resolving or indeed worsen (e.g. increasing dysphagia, airway compromise), transoral drainage in the operating-theatre should be performed (with radiologically-guided drainage as a back up). A lower threshold for intervention should be observed for very young children. When anaesthesia is required for scanning, the child should be transferred directly to the operating-theatre for drainage if the scan is positive for an RPA.
(4) Treatment should ideally be by a consultant paediatric otolaryngologist. Where surgical drainage is required, a senior paediatric anaesthetist should be involved.
(5) Prolonged intubation or even a surgical airway should always be considered for any patients at risk of airway compromise. This should be managed in conjunction with paediatric intensivists. Again, the youngest patients pose the greatest risk; if in doubt take the safest option available.

A sensible approach, awareness of the pitfalls and good clinical acumen should enable clinicians involved in these cases to ensure they are well managed.

## Acknowledgement

Mr A. A. Moir, Consultant Paediatric Otolaryngologist, Leicester Royal Infirmary.

### References

1 Dodds B, Maniglia AJ. Peritonsillar and neck abscesses in the pediatric age group. *Laryngoscope* 1988;**98**:956–9
2 May M. Neck masses in children: diagnosis and treatment. *Pediatr Ann* 1976;**5**:518–35
3 Wajn J, von Buchwald C, Arndal H. [Late diagnosis of retropharyngeal abscess in an infant]. *Ugeskrift for Laeger* 1993;**155**:2211–2
4 Har-El G, Aroesty JH, Shaha A, Lucente FE. Changing trends in deep neck abscess. A retrospective study of 110 patients. *Oral Surg Oral Med Oral Pathol* 1994;**7**:446–50
5 Thompson JW, Cohen SR, Reddix P. Retropharyngeal abscess in children: a retrospective and historical analysis. *Laryngoscope* 1988;**98**:589–92
6 Parhiscar A, Har-El G. Deep neck abscess: a retrospective review of 210 cases. *Ann Otol Rhinol Laryngol* 2001; **110**:1051–4

https://doi.org/10.1258/0022215042790538 Published online by Cambridge University Press

7 Ungkanont K, Yellon RF, Weissman JL, Casselbrant ML, Gonzalez-Valdepena H, Bluestone CD. Head and neck space infections in infants and children. *Otolaryngol Head Neck Surg* 1995;**112**:375–82
8 Kirse DJ, Robertson DW. Surgical management of retropharyngeal space infections in children. *Laryngoscope* 2001;**111**:1413–22
9 Nagy M, Pizzuto M, Backstrom J, Brodsky L. Deep neck infections in children: a new approach to diagnosis and treatment. *Laryngoscope* 1997;**107**:1627–34
10 Choi SS, Vezina LG, Grundfast KM. Relative incidence and alternative approaches for surgical drainage of different types of deep neck abscesses in children. *Arch Otolaryngol Head Neck Surg* 1997;**123**:1271–5
11 Chong VF, Fan YF. Radiology of the retropharyngeal space. *Clin Radiol* 2000;**55**:740–8
12 Blomquist IK, Bayer AS. Life-threatening deep fascial space infections of the head and neck. *Infect Dis Clin North Am* 1988;**2**:237–64
13 Sinnatamby CS. Tissue spaces of the neck. In: *Last's Anatomy* 10th edn. London: Churchill Livingstone, 1999;323–4
14 Husaru AN, Nedzelski JM. Retropharyngeal abscess and upper airway obstruction. *J Otolaryngol* 1979;**8**:443
15 Levitt G. Cervical fascia and deep neck infections. *Laryngoscope* 1970;**80**:409
16 Barratt GE, Koopmann CF, Jr., Coulthard SW. Retropharyngeal abscess—a ten-year experience. *Laryngoscope* 1984;**94**:455–63
17 Coulthard M, Isaacs D. Retropharyngeal abscess. *Arch Dis Child* 1991;**66**:1227–30
18 Morrison JE, Jr., Pashley NR. Retropharyngeal abscesses in children: a 10-year review. *Pediatr Emerg Care* 1988; **4**:9–11
19 Tan PT, Chang LY, Huang YC, Chiu CH, Wang CR, Lin TY. Deep neck infections in children. *J Microbiol Immunol Infect* 2001;**34**:287–92
20 Goldenberg D, Golz A, Joachims HZ. Retropharyngeal abscess: a clinical review. *J Laryngol Otol* 1997;**111**:546–50
21 Gidley PW, Ghorayeb BY, Stiernberg CM. Contemporary management of deep neck space infections. *Otolaryngol Head Neck Surg* 1997;**116**:16–22
22 Roland NJ MR, McCombe AW. Neck space infections. In: *Key Topics In Otolaryngology* 2nd edn. Oxford: BIOS; 2001;189
23 el-Sayed Y, al Dousary S. Deep-neck space abscesses. *J Otolaryngol* 1996;**25**:227–33
24 Asmar BI. Bacteriology of retropharyngeal abscess in children. *Pediatr Infect Dis J* 1990;**9**:595–7
25 Brook I. Diagnosis and management of anaerobic infections of the head and neck. *Ann Otol Rhinol Laryngol Suppl* 1992;**155**:9–15
26 Tom MB, Rice DH. Presentation and management of neck abscess: a retrospective analysis. *Laryngoscope* 1988;**98**:877–80
27 Stiernberg CM. Deep-neck space infections. Diagnosis and management. *Arch Otolaryngol Head Neck Surg* 1986; **112**:1274–9
28 Lobo S, Williams H, Singh V. Massive retropharyngeal lymphadenopathy in an infant: an unusual presentation of infectious mononucleosis. *J Laryngol Otol* 2004; **118**:983–4
29 Schmal F, Stoll W. [Differential diagnosis and management of retropharyngeal space-occupying lesions]. *HNO* 2002; **50**:418–23
30 Sethi DS, Stanley RE. Deep neck abscesses—changing trends. *J Laryngol Otol* 1994;**108**:138-43
31 Yeo Ting C. Acute stridor in childhood; retropharyngeal abscess. *Med J Malaysia* 1988;**43**:65–73
32 Toback S, Herr S. Retropharyngeal abscess in a toxic-appearing infant. *Pediatr Emerg Care* 2001;**17**:255–7
33 Flanary VA, Conley SF. Pediatric deep space neck infections: the Medical College of Wisconsin experience. *Int J Pediatr Otorhinolaryngol* 1997;**38**:263–71
34 Croskell SE, McElligott KM, Young PC. Irritability and neck stiffness in a five-month-old infant. *Pediatr Infect Dis J* 2001;**20**:728–9
35 Garcia-Perez A, Regidor FJ, Perez-Lescure J, Martin A, Plaza G, Abdelkader M. [Non-dystonic torticollis. A report of a case secondary to retropharyngeal abscess]. *Revist Neurol* 2000;**30**:1157–60
36 Harries PG. Retropharyngeal abscess and acute torticollis. *J Laryngol Otol* 1997;**11**:1183–5
37 Plaza Mayor G, Alvarez-Cortinas JF, Garcia Perez A, Abdelkader Maanan M, de los Santos Granados G. [Torticollis after unnoticed pharyngeal perforation: suspected retropharyngeal abscess]. *An Otorrinolaringol Ibero Am* 2001;**28**:445–57
38 Vazquez Lopez ME, Gonzalez Gomez FJ, Fernandez Iglesias JL, Morales Redondo R. [Torticollis secondary to retropharyngeal abscess]. *An Espanol Pediatr* 2001; **55**:288–9
39 Buchwald C, Nissen F, Thomsen J. Parapharyngeal abscess and torticollis. *J Laryngol Otol* 1990;**104**:829–30
40 Kuhnemann S, Keck T, Riechelmann H, Rettinger G. [Rational diagnosis of pediatric pharyngeal abscess]. *Laryngorhinootologie* 2001;**80**:263–8
41 Wholey MH, Bruwer AJ, Baker HL Jr. The lateral roentgenogram of the neck. *Radiology* 1958;**71**:350–56
42 Haug RH, Wible RT, Lieberman J. Measurement standards for the prevertebral region in the lateral soft-tissue radiograph of the neck. *J Oral Maxillofac Surg* 1991; **49**:1149–51
43 Boucher C, Dorion D, Fisch C. Retropharyngeal abscesses: a clinical and radiologic correlation. *J Otolaryngol* 1999; **28**:134–7
44 Hartmann RW. Recognition of retropharyngeal abscess in children. *Am Fam Phys* 1992;**46**:193–6
45 Ravindranath T, Janakiraman N, Harris V. Computed tomography in diagnosing retropharyngeal abscess in children. *Clin Pediatr* 1993;**32**:242–4
46 Riccabona M, Grubbauer HM. [Ultrasound diagnosis of parapharyngeal abscess in infancy]. *Ultraschall Med* 1994; **15**:43–4
47 Kreutzer EW, Jafek BW, Johnson ML, Zunkel DE. Ultrasonography in the preoperative evaluation of neck abscesses. *Head Neck Surg* 1982;**4**:290–5
48 Ben-Ami T, Yousefzadeh DK, Aramburo MJ. Pre-suppurative phase of retropharyngeal infection: contribution of ultrasonography in the diagnosis and treatment. *Pediatr Radiol* 1990;**21**:23–6
49 Glasier CM, Stark JE, Jacobs RF, Mancias P, Leithiser RE, Jr., Seibert RW, *et al*. CT and ultrasound imaging of retropharyngeal abscesses in children. *Am J Neuroradiol* 1992;**13**:1191–5
50 Chao HC, Chiu CH, Lin SJ, Lin TY. Colour Doppler ultrasonography of retropharyngeal abscess. *J Otolaryngol* 1999;**28**:138–41
51 Lalakea M, Messner AH. Retropharyngeal abscess management in children: current practices. *Otolaryngol Head Neck Surg* 1999;**121**:398–405
52 Weber AL, Siciliano A. CT and MR imaging evaluation of neck infections with clinical correlations. *Radiol Clin North Am* 2000;**38**:941–68
53 Lee SS, Schwartz RH, Bahadori RS. Retropharyngeal abscess: epiglottitis of the new millennium. *J Pediatr* 2001; **138**:435–7
54 Holt GM, McManus K, Newman, RK, Potter JL, Tinsley PP. Computed tomography in the diagnosis of deep-neck infections. *Arch Otolaryngol Head Neck Surg* 1982;**108**:693
55 Stone ME, Walner DL, Koch BL, Egelhoff JC, Myer CM. Correlation between computed tomography and surgical findings in retropharyngeal inflammatory processes in children. *Int J Pediatr Otorhinolaryngol* 1999;**49**:121–5
56 Sichel JY, Gomori JM, Saah D, Elidan J. Parapharyngeal abscess in children: the role of CT for diagnosis and treatment. *Int J Pediatr Otorhinolaryngol* 1996;**35**:213–22
57 Brechtelsbauer PB, Garetz SL, Gebarski SS, Bradford CR. Retropharyngeal abscess: pitfalls of plain films and computed tomography. *Am J Otolaryngol* 1997;**18**:258–62
58 Lazor JB, Cunningham MJ, Eavey RD, Weber AL. Comparison of computed tomography and surgical findings in deep neck infections. *Otolaryngol Head Neck Surg* 1994;**111**:746–50
59 Welsh LW, Welsh JJ, Gregor FA. Radiographic analysis of deep cervical abscesses. *Ann Otol Rhinol Laryngol* 1992; **101**:854–60
60 Broughton RA. Nonsurgical management of deep neck infections in children. *Pediatr Infect Dis* J 1992;**11**:14–8

61 Eliashar R, Sichel JY, Gomori JM, Saah D, Elidan J. Role of computed tomography scan in the diagnosis and treatment of deep neck infections in children. *Laryngoscope* 1999;**109**:844
62 Sichel JY, Dano I, Hocwald E, Biron A, Eliashar R. Nonsurgical management of parapharyngeal space infections: a prospective study. *Laryngoscope* 2002; **112**:906–10
63 Plaza Mayor G, Martinez-San Millan J, Martinez-Vidal A. Is conservative treatment of deep neck space infections appropriate? *Head Neck* 2001;**23**:126–33
64 Yeow KM, Hao SP, Liao CT. US-guided percutaneous catheter drainage of a deep retropharyngeal abscess. *J Vasc Interv Radiol* 1999;**10**:1365–9
65 Poe LB, Petro GR, Matta I. Percutaneous CT-guided aspiration of deep neck abscesses. *Am J Neuroradiol* 1996; **17**:1359–63
66 Cottrell DA, Bankoff M, Norris LH. Computed tomography-guided percutaneous drainage of a head and neck infection. *J Oral Maxillofac Surg* 1992;**50**:1119–21
67 Pontell J, Har-El G, Lucente FE. Retropharyngeal abscess: clinical review. *Ear Nose Throat J* 1995;**74**:701–4
68 Sztajnbok J, Grassi MS, Katayama DM, Troster EJ. Descending suppurative mediastinitis: nonsurgical approach to this unusual complication of retropharyngeal abscesses in childhood. *Pediatr Emerg Care* 1999;**15**:341–3.

Address for correspondence:
Mr C.M. Philpott,
Specialist Registrar in Otolaryngology,
James Paget Hospital,
Gorleston,
Great Yarmouth,
Norfolk NR31 6LA, UK.

E-mail: carl.philpott@btopenworld.com

Mr C.M. Philpott takes responsibility for the integrity of the content of the paper.
Competing interests: None declared