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CLINICAL REPORT

Use of Navigation System in the Management of Deep Neck Space Infection—A Case Report

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Abstract
Deep neck space infections are an ENT (Ear, Nose, Throat) emergency. Navigation system (NS) can be utilized to assist in locating the exact site of pathology and avoiding iatrogenic injury especially in paediatric patients. This manuscript explores the importance of NS in managing retro pharyngeal abscess (RPA) in an 11 month old baby.

Introduction

Deep neck space infections (DNSIs) are an ENT emergency where the patient can rapidly deteriorate due to airway compromise. Anatomical knowledge of the region and routes of spread is essential for its management. While much of the literature on navigation guided surgery in ENT focuses on endoscopic trans-nasal approaches for sinus and pituitary surgeries, our manuscript reports a unique; navigation guided intraoral drainage of a RPA. Here, we report our experience of using magnetic resonance imaging (MRI) guided, NS assisted drainage of an inconspicuous DNSI in an infant. Informed consent was obtained from parents before reporting this case.

Case Report

An eleven month old baby was referred to us by the paediatrician complaining of fever, refusal of feeds and irritability for four days and restricted neck movements to the right side for one day. On examination the child was febrile and irritable and did not allow us to examine her throat. There were multiple palpable lymph nodes on the right side of the neck. Haematological investigations revealed leucocytosis, raised ESR and C – reactive protein. X- Ray soft tissue of neck lateral view showed increased width of the prevertebral space which was suspicious for RPA. Gadolinium enhanced MRI of the neck revealed multiple enlarged conglomerate lymph nodes in the retropharyngeal space. The largest one measured $2 \times 1.2 \times 1$ cm with a volume of about 1.2 ml with peripheral enhancement and central necrosis suggesting an abscess on T1 weighted axial image. These were displacing the carotid sheath posterolaterally (Fig. 1). considering the findings, diagnosis of RPA was made and treated with empirical antibiotics for 48 h. Baby was then taken up for incision and drainage as she was not improving. Doyen's mouth gag and tongue depressor were used to visualise the posterior pharyngeal wall. Based on imaging, the abscess extends from C2 to C3 Vertebral level and we anticipated a

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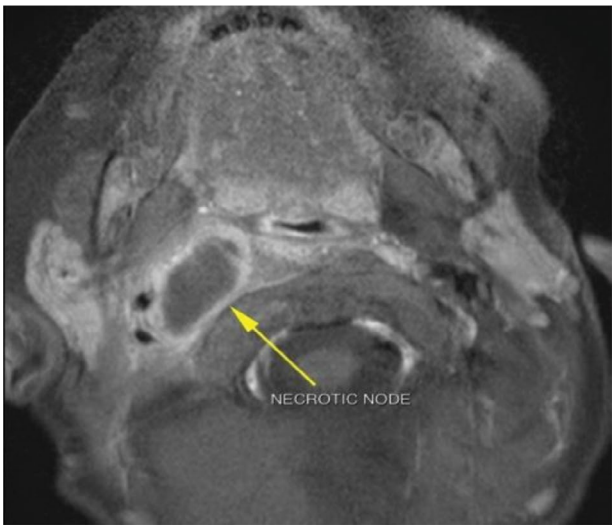

Fig. 1 Preoperative axial T1 weighted MRI showing necrotic node in the retropharyngeal space displacing the carotid sheath

bulge in the posterior pharyngeal wall, however there was none visible which may be due to neck extension. Stab incision was given over the right side of midline of posterior pharyngeal wall keeping the level of hard palate as the superior and hyoid bone as inferior landmarks. Dissection was carried out to reach the abscess cavity but we were unable to reach. The reason being there was no single large localised abscess; instead there were numerous inflamed, conglomerate and necrotic nodes. We then took the decision to use Intraoperative Electromagnetic NS using the MRI imaging. We use Medtronic StealthStation®S7 AxiEM™ electromagnetic NS with two varieties of probes for sinus and skull base surgeries. One of the probes is short, thick; bayonet shaped (REF 9,735,319) and another one being long and slender Stylet type (REF 9,735,428). We used the same Stylet type probe in our case without any alteration as it was convient to apply in the field of dissection which was small and deep. Navigation probe was introduced intraorally and the abscess site was located half a centimetre above and medial to the site of our initial incision into which we introduced a 16 gauge needle with syringe and aspirated thick pus which was sent for microbiological examination (Fig. 2). Furthermore the wall was dissected open and drained. Procedure was uneventful. Culture revealed Staphylococcus aureus and Enterobacter cloacae complex and was treated based on sensitivity. Baby recovered well in the postoperative period.

Discussion

Deep neck spaces are potential spaces that are formed between the layers of the deep cervical fascia and the most important ones are retropharyngeal and parapharyngeal space [1].The retropharyngeal space extends from skull base superiorly to T4 vertebra inferiorly, bounded anteriorly by the buccopharyngeal fascia, laterally by the carotid sheath and posteriorly by the prevertebral fascia [2]. It houses lymph nodes which drain the pharynx and lie medial to the internal carotid artery.

Upper respiratory tract infection is the most common cause of RPA in children, followed by odontogenic infections and trauma [1, 3–5]. Pharyngeal infections can lead to suppurative adenitis of these nodes leading to abscess formation if left untreated. These nodes start involuting by the age of five years making RPA more common in children than adults [3, 5–7]. RPA is usually polymicrobial in origin and presents with fever, sore throat, and neck stiffness progressing to stridor, mediastinitis, cavernous sinus thrombosis, and rupture of abscess if untreated [3]. Imaging of the neck (X ray, CT, MRI) are the vital tools for diagnosis which enables the operating surgeon to delineate the site and extent of the disease. Though CT scan is highly sensitive (92%) in diagnosing RPA [3], we performed a MRI as it has superior soft tissue discrimination, minimizes radiation exposure and was feasible at our centre [8].

Review of literature shows use of NS in draining abscesses from pterygomandibular space and infratemporal fossa but to our knowledge this is the first case report of a RPA being treated using NS [9, 10]. Precision is crucial as vital structures surround the surgical site and the area of dissection is restricted in paediatric patients with inflamed mucosa. In our case the 3-dimensional view provided by MRI-guided navigation facilitated trans-oral approach by showing the precise location of the abscess followed by its drainage with minimal operative time and protection to nearby neurovascular bundle. NS might be helpful to close the gap between preoperative imaging and surgical intraoperative findings as happened in our case.

RPA is generally treated with conventional method where the bulge is obvious; we recommend application of navigation assisted drainage as a useful surgical tool in those cases where the bulge is not obvious and access is difficult. Employing advanced technology which provides surgical guidance would help avoid the complications, decrease the operating time and aid in patient's recovery especially in paediatric patients with small abscess or necrotic lymph nodes.

There are certain limitations for application of NS such as its availability and the financial burden which hampers its application.

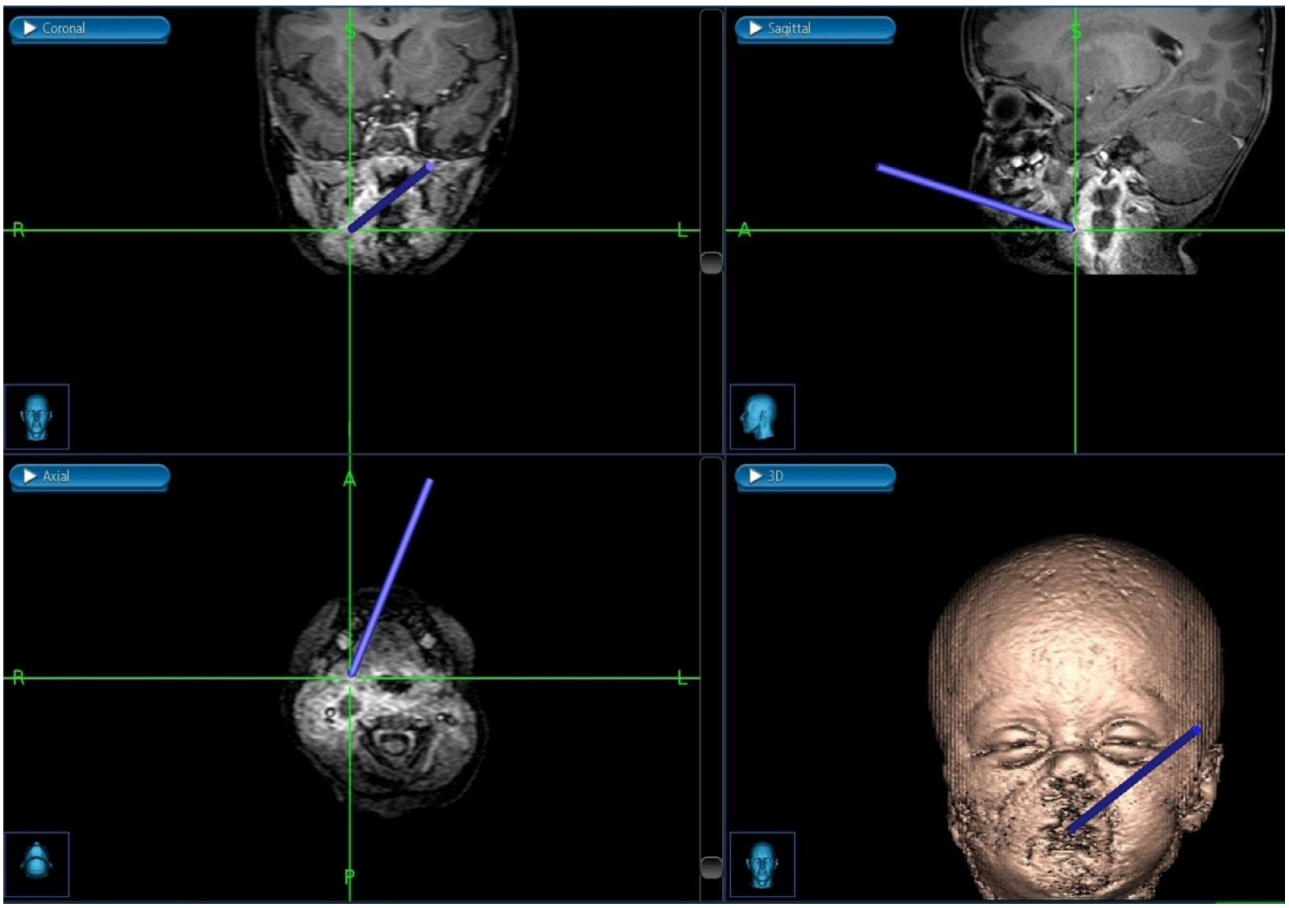

Fig. 2 Intraoperative MRI guided navigation: The image-guided navigation probe is shown in the retropharyngeal space under live image localization using MR images in coronal, axial, and sagittal views

Conclusion

Though the incidence of RPA has declined drastically over the past few decades, it still occurs with considerable frequency and can be associated with a high morbidity and mortality. The surgeon should consider image-guidance as a potential adjunct for intraoperative localization and in protecting vital structures during deep neck abscess drainage.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s12070-023-04406-9.

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Declarations

Compliance with ethical standardsmaintained – maintained.

Conflict of Interest Dr. Usha G, Dr. Jeehan Wadia, Dr Shreyas V, Dr. Nishit J Shah declare that we have no conflict of interest.

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