Treatment for parotid abscess: a systematic review

Alberto Maria Saibene1,2, Fabiana Allevi1,3, Tareck Ayad1,4, Jérome R. Lechien1,5, Miguel Mayo-Yáñez1,6,7, Krzysztof Piersiala1,8, Carlos M. Chiesa-Estomba1,9

1 International Federation of Otorhinolaryngological Societies (YO-IFOS) Head and Neck Research Group, Paris, France; 2 Otolaryngology Unit, Santi Paolo e Carlo Hospital, Department of Health Sciences, Università degli Studi di Milano, Milan, Italy; 3 Maxillofacial Surgery Unit, Santi Paolo e Carlo Hospital, Department of Health Sciences, Università degli Studi di Milano, Milan, Italy; 4 Division of Otolaryngology-Head and Neck Surgery, Centre Hospitalier de L’Université de Montréal, Montreal, QC, Canada; 5 Department of Otolaryngology-Head and Neck Surgery, Foch Hospital, Paris Saclay University, Saint-Aubin, France; 6 Otorhinolaryngology – Head and Neck Surgery Department, Complexo Hospitalario Universitario A Coruña (CHUAC), 15006, A Coruña, Galicia, Spain; 7 Clinical Research in Medicine, International Center for Doctorate and Advanced Studies (CIEDUS), Universidade de Santiago de Compostela (USC), 15782, Santiago de Compostela, Galicia, Spain; 8 Department of Clinical Science, Intervention and Technology (CLINTEC), Karolinska Institutet, Stockholm, Sweden; 9 Department of Otorhinolaryngology - Head and Neck Surgery, Hospital Universitario Donostia / Biodonostia Research Institute, San Sebastian, Spain

A.M. Saibene and F. Allevi contributed equally to this work.

SUMMARY
A parotid abscess is a dangerous complication of parotitis. In this study, we aimed to define current treatment concepts for parotid abscess, focusing on different management options. The authors performed a PRISMA-compliant systematic review across multiple databases including all original studies published until January 2021 focusing on treatment of parotid abscess. Studies specifying treatment modalities and treatment success rates were included based on abstract and full-text selection. The authors assessed study quality, demographics, success rates, management modalities and adverse events. Among 1,318 citations, 18 studies met our inclusion criteria. Twelve studies relied only on incision and drainage with antibiotic therapy; the remaining 6 compared different treatment modalities (incision and drainage versus exclusive medical therapy or ultrasound-guided drainage). Heterogeneity between studies precluded meta-analysis of data. The review showed that antibiotics remain the mainstay of treatment for parotid abscess. Conversely, the role of incision and drainage, and aspiration should be studied further. The higher rate of complications following incision and drainage suggests a more conservative approach is needed. Incision and drainage remain the main salvage option for conservative treatment failures.

KEY WORDS: salivary gland, sialadenitis, antibiotics, drainage, parotitis

RIASSUNTO
Gli ascessi parotidei rappresentano una complicanza della parotite. Questo studio mira a definire i concetti moderni di trattamento della parotite, che in passato sono stati considerati diversi. È stato eseguito un revisione sistematica della letteratura secondo il protocollo PRISMA. Gli studi riportanti modalità di trattamento e tasso di successo sono stati inclusi. La revisione ha evidenziato che l’incisione e drenaggio rimane il trattamento di scelta per l’ascesso parotideo. Inoltre, l’ascesso parotideo dovrebbe essere trattato in modo conservativo. Incisione e drenaggio restano la principale risposta al fallimento della terapia conservativa.

PAROLE CHIAVE: ghiandole salivari, scialoadenite, antibiotici, drenaggio, parotite
Treatment for parotid abscesses (PA) represents another iteration of empiric application of the Latin adage “Ubi pus, ibi evacua”. They might be regarded just like any other deep neck space abscess, where pus evacuation is required to prevent fasciitis and allow antibiotics to reach the infection site with adequate perfusion. Nevertheless, the well-known anatomical peculiarities of the parotid space (most notably the presence of the facial nerve), make their management definitely more complex. Parotitis, which represents the most common inflammatory disease of the parotid gland, only sporadically evolves into PA. PA is more common among elderly or immunocompromised patients, but their presentation in immunocompetent healthy children and adults is well documented in clinical practice. PA is frequently due to S. aureus infection and are usually managed with a combination of intravenous antibiotics and abscess incision and drainage. Nevertheless, treatment options such as abscess aspiration (with or without radiological guidance) or simple medical management have been reported systematically in the literature. Often different treatment options are also employed simply according to the clinicians’ preference, even in the context of the same head and neck team.

This evolution in PA management follows a common de-escalation trend in management of deep neck spaces. Preliminary prospective and meta-analytic data show that aspiration or exclusive medical management of neck abscess may yield results that are non-inferior to incision and drainage, while obviously reducing procedural complications.

The present literature on PA treatment is characterised by small studies and a general lack of prospective data, and it is therefore unable to provide guidance in the choice of treatment. In this context, we conducted a systematic review to define current concepts in PA management, mainly focusing on the following approaches: incision and drainage, aspiration, and exclusive medical treatment.

Materials and methods

This systematic review was performed respecting PRISMA Statement and PICOTS criteria. Its protocol is registered and publicly available in the International Prospective Register of Systematic Reviews (PROSPERO) (no. CRD42021231347).

PICOTS criteria

The PICOTS criteria for this review were:

- Patients: patients with radiologically or clinically diagnosed PA;
- Intervention: PA incision and drainage, aspiration or exclusive medical therapy;
- Comparator: different PA management options (as described in the intervention criterion);
- Outcome: treatment success (defined as clinical evidence of infection resolution) as the primary outcome, treatment complications as a secondary outcome;
- Time: short term outcomes;
- Setting: specialty care for patients admitted for PA.

Search strategy

The review was performed between January 18 and April 10, 2021. We conducted systematic searches for studies in English, Italian, German, French, or Spanish, published until the search date and reporting original data. On January 18, 2021, we searched the MEDLINE, Embase, Web of Science, Cochrane Library, and ClinicalTrials.gov databases with wide search strategies for all salivary gland abscesses to maximise the results. Full search details and results are detailed in Table I.

We included any study dealing, entirely or partly, with the treatment of PA in humans. We excluded meta-analyses, systematic and narrative reviews, grey literature, pre-clinical studies and case reports. References from review articles were hand-checked for additional potentially relevant studies. No minimum study population was required. We included only studies that specified treatment modalities and treatment outcomes and excluded studies focusing systematically on mycobacterial abscesses.

Abstracts and full texts were reviewed in duplicate by different authors. At the abstract stage, we included all studies deemed eligible by at least one rater. At the full-text review stage, disagreements were resolved by consensus.

Data extraction and quality assessment

For each article, we recorded the number of PA patients, male to female ratio, patient age, potential focus on specific subpopulations, abscess diagnostic modalities, PA treatments (which were classified between incision and drainage, i.e. skin or oral open incision with abscess drainage; aspiration, i.e. radiology-guided or unguided needle aspiration without incision; and exclusive medical therapy, i.e. without any local invasive procedure associated), antibiotic treatment(s), therapeutic success, complications and microbial cultures.

Studies were assessed with the National Heart, Lung, and Blood Institute Study Quality Assessment Tools (NHI-SQAT). Articles were rated in duplicate by two authors and disagreements were resolved by consensus. Articles were rated as good, fair, or poor if they fulfilled, respectively, at least 80% of the items required by the NHI-SQAT, between 50% and 80% of the items, and less than 50% of the items.
Levels of evidence were scored according to the Oxford Centre for Evidence-based Medicine (OCEBM) level of evidence guide 14. Search results collection, selections, and data extraction were performed with the Google Sheets web application (Google LLC, Mountain View, CA, US). A meta-analysis was not performed as originally planned due to the heterogeneity of collected data, as detailed in the discussion.

Results

Table I. Search keys and results for each database consulted.

| Database            | Search key                                                                 | Date of search   | No. of items |
|---------------------|---------------------------------------------------------------------------|-----------------|--------------|
| Medline             | ("parotid gland"[MeSH Terms] OR ("parotid"[All Fields] AND "gland"[All Fields]) OR "parotid gland"[All Fields] OR "parotid"[All Fields] OR "parotids"[All Fields] OR "parotid"[All Fields] OR "parotideal"[All Fields] AND ("abscess"[MeSH Terms] OR "abscess"[All Fields] OR "abscesses"[All Fields] OR "abscession"[All Fields] OR "abscessed"[All Fields] OR "abscessing"[All Fields]) OR ("salivary"[All Fields] AND "abscess"[MeSH Terms] OR "abscess"[All Fields] OR "abscesses"[All Fields] OR "abscession"[All Fields] OR "abscessed"[All Fields] OR "abscessing"[All Fields])) OR ("sialadenitis" OR "sialoadenitis" OR "sialoaedentitis" OR "sialoadenitis" OR "sialoadentitis" OR "salivary" OR "salivary gland" OR "salivary glands") AND ("abscess"[MeSH Terms] OR "abscess"[All Fields] OR "abscesses"[All Fields] OR "abscession"[All Fields] OR "abscessed"[All Fields] OR "abscessing"[All Fields]) OR ("sialadenitis" OR "sialoadenitis" OR "sialoaedentitis" OR "sialoadenitis" OR "sialoadentitis" OR "salivary" OR "salivary gland" OR "salivary glands") | January 18th, 2021 | 581          |
| Clinicaltrials.gov  | (parotid AND abscess) OR (salivary AND abscess) OR (sialoadenitis AND abscess) |                 | 5            |
| Cochrane Library    | (parotid AND abscess) OR (salivary AND abscess) OR (sialoadenitis AND abscess) in All Text - (Word variations have been searched) |                 | 16           |
| Web of Science      | ALL FIELDS: (parotid AND abscess) OR (salivary AND abscess) OR (sialoadenitis AND abscess) | Timespan: All years. Indexes: SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC | 338          |
| Embase              | parotid AND ("abscess"/exp OR abscess) OR (salivary AND ("abscess"/exp OR abscess)) OR ("sialoadenitis"/exp OR sialoadenitis) AND ("abscess"/exp OR abscess)) |                 | 987          |

The 18 studies had 211 participants with parotid gland abscesses. Patient numerosity ranged from a 40-patient series to a neck abscess case report with a single PA patient. Ten articles reported a male to female ratio of included patients, showing a male sex predominance (99 male patients and 68 female patients). Eight studies were restricted to pediatric patients, while there were no age restrictions in the remaining 10. Six studies did not report data on patient age other than inclusion criteria and 3 had a mixed paediatric-adult population. When considering articles not restricted to paediatric cases, patients were on average in their 4th or 5th decade (6 of 10 papers). Computed tomography and ultrasound were the most common diagnostic modalities, although some studies relied partly or completely on clinical examination only. Magnetic resonance imaging was used sporadically in a few selected cases. All patients were treated with one or more antibiotic therapies, often further tailored to results of microbial culture. Most patients (n = 176) also underwent abscess incision and drainage, while others (n = 18) underwent aspiration either with or without radiological guidance. Eleven patients received antibiotic treatment only while the abscess spontaneously ruptured in 5 patients. A single patient refused all treatments (including antibiotic treatment) and died of septic complications. Eight of 18 studies did not specify the antibiotic regimen used. Beta-lactam antibiotics with beta-lactamase inhibitors were used in 6 studies and cephalosporins in 5, thus being the most frequently proposed antibiotic treatments. Five studies reported adjusting antibiotic therapy to antibiogram results where indicated. Details on antibiotic regimens are reported in Table III.

The overall treatment success rate was extremely variable,
Figure 1. PRISMA flow diagram of study selection through systematic review.

Figure 2. Geographical representation of the countries of origin of the reviewed articles (in green: one article only; in blue: two or more articles).
ranging from 50% to 100%, though higher and less variable in studies with > 10 patients (80-97.2%). The overall mortality rate was 2.37%, with deaths occurring almost exclusively in extremely compromised patients. Detailed surgical, therapeutic and outcomes for each study are reported in Table III.

Nine cases of treatment complications were reported (3 salivary fistulae, 4 facial palsies - one of which was reported, beyond our review temporal scope, as definitive - and 2 wound healing problems). Seven of 9 complications were reported in patients undergoing abscess incision and drainage and 2 in patients with spontaneous abscess rupturing.

Fourteen studies reported microbial culture results, which are detailed in Table IV.

**Discussion**

Our review shows that at present no univocal management choices are available for PA and the literature lacks specific guidelines or well-designed prospective studies to allow for evidence-based treatment. This is the first systematic review to address the treatment of PA and confirms the overall good treatment success rates, though not free from failure and even deaths, especially in more fragile patients.
### Table III. Diagnostic modalities, treatment arms, and outcomes for reviewed studies.

| Author(s) | Year | Abscess diagnostic modalities | Treatment arms | Antibiotic treatment | Outcome | Other complications |
|-----------|------|-------------------------------|----------------|----------------------|---------|---------------------|
| Cheng et al., 2019 | 4 | CT (n = 19) | ABx + I&D (n = 14) | Amoxicillin/clavulanate (n = 11), or clindamycin (n = 8) first, antibiogram driven next | 14/14 cured | None |
| | | | ABx + US-guided aspiration (n = 4) | | 4/4 cured | |
| | | | ABx (n = 1) | | | |
| Chi et al., 2014 | 15 | CT (n = 14) | ABx + I&D (n = 14) | UNS broad-spectrum ABx | 14/14 cured | Salivary fistula (n = 1) |
| Cmejrek et al., 2002 | 16 | UNS | ABx + I&D (n = 1) | UNS empirical ABx first, antibiogram-driven next | 1/1 cured | None |
| Daramola et al., 2009 | 17 | CT (n = 3) | ABx + I&D (n = 2) | UNS empirical ABx first, antibiogram-driven next | 2/2 cured | None reported |
| | | | ABx (n = 1) | | | |
| de la Cuesta et al., 2018 | 18 | UNS | ABx + I&D (n = 4) | UNS ABx | 1/1 cured | None |
| | | | ABx (n = 1) | | | |
| Franklyn et al., 2016 | 7 | US (n = 17), CT+MRI (n=14), clinical (n = 9) | ABx + I&D (n = 30) | Clindamycin and metronidazole first, antibiogram-driven next | 26/30 cured, 4/30 required another I&D | None |
| | | | ABx + unguided aspiration (n = 5) | | 2/5 cured, 3/5 required I&D | |
| | | | ABx in spontaneous rupture (n = 1) | | 1/1 cured | |
| | | | ABx (n = 3) | | 3/3 cured | |
| | | | no therapy (n = 1) | | 1/1 died | |
| Ganesh and Leese, 2005 | 5 | CT (n = 9), clinical (n = 1) | ABx + I&D (n = 8) | UNS ABx (most frequently ceftriaxone) | 7/8 cured, 1 required another I&D | None |
| | | | ABx in spontaneous rupture (n = 1) | | 1/1 cured | |
| | | | ABx + CT-guided aspiration (n = 1) | | 1/1 cured | |
| Jabońska-Jesionrowska et al., 2017 | 19 | UNS | ABx + I&D (n = 2) | Amoxiclavulanate or cephalosporin with clindamycin | 2/2 cured | None |
| Joo et al., 2017 | 9 | CT + US (n = 4) | ABx + US-guided aspiration (n = 4) | UNS ABx | 4/4 cured | None |
| Kim et al., 2018 | 20 | CT (n = 13) | ABx + I&D (n = 7) | UNS broad-spectrum ABx | 6/7 cured, 1/7 required another I&D | None |
| | | | ABx (n = 6) | | 6/6 cured | |
| Lakshmi Narayana et al., 2015 | 21 | US (n = 3), clinical (n = 4) | ABx + I&D (n = 7) | Amoxiclavulanate, changed to clindamycin due to lack of response in 2 patients | 7/7 cured | Temporary marginal branch palsies (n = 2) |
| Laskawi et al., 2005 | 22 | UNS | ABx + I&D (n = 5) | Amoxicillin and/or flucloxacillin | 5/5 cured | None |

111
The review included a total of 18 studies involving 211 patients diagnosed with PA, allowing for a comprehensive evaluation of the literature. Most of the included studies were of good or fair methodological quality. Data were almost exclusively retrospectively collected and no randomised controlled trials were found.

Treatment success rates overlap between different management choices, while rates of treatment complication were unevenly distributed in the three groups studied. No complications were reported in the 39 patients treated with aspiration or medical therapy, while 7 of 172 patients treated with incision and drainage experienced complications, the most frequent being facial nerve damage. Therefore, given the comparable success rates, a different complication rate makes aspiration or exclusive medical therapy generally preferable to incision and drainage. Even if this observation requires further prospective validation, a more conservative initial approach to PA might seem advisable. A correct choice of antibiotic would allow for adequate drug availability with conservative treatment, leaving incision and drainage as a backup option for patients failing first-line treatment.

Antibiotic regimens therefore become a significant matter of debate for PA treatment. Although cephalosporins and beta-lactam with beta-lactamase inhibitors remain the most frequent choice, our systematic review outlined a plethora of regimens selected with little to no homogeneity often providing scarce details on administration, doses and duration. Given that based on the reviewed data *S. aureus* and *S. pneumoniae* represent the most frequent cultured bacteria in PA, amoxicillin-clavulanate should be regarded as the most obvious choice, while second-line treatments might be reserved for non-responders. The specific characteristics of each patient (included but not limited to immune status or prolonged hospitalisation) must be taken into account, as well as potential drug resistances that can only be assessed.

### Table III. Diagnostic modalities, treatment arms, and outcomes for reviewed studies (follows).

| Treatment arms | Antibiotic treatment | Outcome | Other complications |
|----------------|----------------------|---------|---------------------|
| Mahawerawat and Kasemsiri, 2018 23 | ABx + I&D (n = 22) | Ceftazidime followed by co-trimoxazole (either with or without doxycycline) or amoxiclavulanate | 21/22 cured, 1/22 died | None |
| Nusem-Horowitz, 1995 24 | ABx + I&D (n = 4) | Penicillin G and cloxacillin | 3/4 healed, 1/4 required another I&D | None |
| Saarinen et al., 2007 25 | ABx (n = 3), MRI (n = 1) | UNS broad-spectrum ABx (in most cases metronidazole with penicillin or cefuroxime; clindamycin in one case) | 3/3 cured | None |
| Stong et al., 2005 26 | ABx + I&D (n = 2) | UNS ABx | 2/2 cured | None |
| Tan and Goh, 2006 27 | ABx + I&D (n = 15, in one case with underlying tumour resection) | IV cephalosporins (n=7) IV ampicillin/clavulanate (n=8), concurrent IV metronidazole (n=10). Changed to antibiogram driven when indicated | 12/15 cured, 2/15 died, 1/15 required another I&D | 1 definitive facial paralysis following re-exploration, 2 wounds with difficult healing |
| Thiede et al., 2002 28 | ABx + I&D (n = 36) | Amoxiclavulanate unless already prescribed prior to I&D | 35/36 cured, 1/36 required parotidectomy | Temporary marginal branch palsy (n=1) |

CT: computed tomography; UNS: unspecified; US: ultrasound; MRI: magnetic resonance imaging; Abx: antibiotics; I&D: incision and drainage.
Treatment for parotid abscess

Lastly, our data show a low prevalence of anaerobic bacteria, which may be nevertheless due to inadequate collection methods. A more thorough investigation of PA microbiology and drug susceptibility represents a future challenge for clinicians.

Our data geographical breakdown points towards a strong research interest in PA in eastern Asia, possibly mirroring a higher local incidence of PA. This could be either due to the local distribution of specific pathogens such as B. pseudomallei or to tropical climate as a facilitating factor in the development of PA. Our study has two significant limitations. First of all, the small number of patients included is reflected by underpowered results, especially for what concerns aspiration and exclusive medical management. Conversely, the inclusion of wide-focus case series with a single or few PA patients, while providing a comprehensive evaluation of the literature, introduces a potential reporting bias. Secondly, we encountered a significant heterogeneity in patient samples and medical therapies. Although we are aware that some patient-/disease-specific characteristics such as abscess size, superficial versus deep lobe location, facial nerve involvement, co-existing sepsis, immune status influence therapeutic choices and outcomes, we were unable to systematically explore their role, as these important features are reported inconsistently and sporadically in the reviewed articles. This heterogeneity made the initially planned meta-analysis potentially misleading. Important variables for making a decision in terms of management, such as the location of the abscess (superficial or deep lobe), the volume of the collection, risk of fistulisation or septicaemic complications, are required both to compare different studies and to question the drainage timing.

Data collected in our review did not allow to allocate patients to an adult or paediatric population in 7 of 18 articles and often allowed a wide age range to the paediatric population thus making assumptions on the validity of our data in a specific age group impossible. Therefore, future prospective studies should also separately take into account paediatric and adult patients, given the inherent treatment differences between the two groups in terms of compliance to therapy and invasive procedures. On a side note, this review does not cover the role of steroid drugs, which have been shown to offer some symptomatic relief in other head and neck abscesses. Given the far less benignant course of PA compared to peritonsillar abscesses, the role of corticosteroids should be explored also with regards to prognosis.

Table IV. Microbiological results (where available) for the included studies.

| Study                        | Culture yield                                                                 |
|------------------------------|-------------------------------------------------------------------------------|
| Cheng et al., 2019 4         | No yield (n = 6), K. pneumoniae (n = 6), S. aureus (n = 2), H. influenzae (n = 1), P. micros (n = 1), M. tuberculosis (n = 1), Candida parapsilosis (n = 1), Salmonella Group D (n = 1) |
| Chi et al., 2014 15           | No yield (n = 6), K. pneumoniae (n = 4), F. magna (n = 1), H. influenzae (n = 1), S. aureus (n = 2) |
| Franklyn et al., 2016 7      | No yield (n = 3), S. aureus (n = 10), Klebsiella spp. (n = 6), B-haemolytic Streptococcus spp. (n = 4), non-haemolytic Streptococcus spp. (n = 1), Enterococcus spp. (n = 2), Proteus spp. (n = 1), E. coli (n = 1), Enterobacter spp. (n = 1), M. tuberculosis (n = 2) |
| Ganesh and Leese, 2005 5     | No yield (n = 5), S. aureus (n = 2), K. pneumoniae (n = 1), E. coli (n = 1), A-haemolytic Streptococcus spp. (n = 1), S. aureus (n = 2) |
| Jabof ska-Jesionowska et al., 2017 18 | No yield (n = 1), P. aeruginosa (n = 1), P. intermedia (n = 1), S. epidermidis (n = 1), P. acnes (n = 1) |
| Kim et al., 2018 20           | No yield (n = 5), S. aureus (n = 1), K. pneumoniae (n = 1), E. coli (n = 1), A-haemolytic Streptococcus spp. (n = 1), Enterococcus spp. (n = 1), E. coli (n = 1), Enterobacter spp. (n = 1), M. tuberculosis (n = 2) |
| Lakshmi Narayana et al., 2015 21 | No yield (n = 3), S. aureus (n = 10), Klebsiella spp. (n = 6), B-haemolytic Streptococcus spp. (n = 4), non-haemolytic Streptococcus spp. (n = 1), Enterococcus spp. (n = 2), Proteus spp. (n = 1), E. coli (n = 1), Enterobacter spp. (n = 1), M. tuberculosis (n = 2) |
| Laskawi et al., 2005 22       | No yield (n = 5), S. aureus (n = 2), K. pneumoniae (n = 1), E. coli (n = 1), A-haemolytic Streptococcus spp. (n = 1), S. aureus (n = 2) |
| Mahawerawat and Kasemsiri, 2018 23 | No yield (n = 1), Gram-negative cocci (n = 1), coagulase negative Staphylococci (n = 1), anaerobic Streptococci (n = 1) |
| Nusem-Horowitz, 1995 24       | No yield (n = 1), S. aureus (n = 1), E. coli (n = 1), Staphylococcus (n = 1) |
| Saarinen et al., 2007 25      | No yield (n = 3), H. Influenzae (n = 3), S. pneumoniae (n = 1), P. mirabilis (n = 1), M. tuberculosis (n = 1) |
| Stong et al., 2005 26         | No yield (n = 5), S. aureus (n = 2), MRSA (n = 1), S. milleri (n = 1), S. pyogenes (n = 1), Klebsiella spp. (n = 3), Psuedomonas spp. (n = 1), Haemophilus spp. (n = 1) |
| Tan and Goh, 2006 2           | No yield (n = 5), S. aureus (n = 2), MRSA (n = 1), S. milleri (n = 1), S. pyogenes (n = 1), Klebsiella spp. (n = 3), Psuedomonas spp. (n = 1), Haemophilus spp. (n = 1) |
| Thiede et al., 2002 3         | No yield (n = 10), S. aureus (n = 9), S. epidermidis (n = 1), Streptococcus spp. (n = 5), Peptostreptococcus spp. (n = 4), M. tuberculosis (n = 2), atypical mycobacteria (n = 2) |
Lastly, we chose to exclude from this review articles focusing only on mycobacterial abscess as they tend to have a slightly different clinical course and management\(^1\), and thus the conclusions drawn from our analysis might not extend to this patient population.

**Conclusions**

Our findings suggest that antibiotics are the mainstay of PA treatment, with excellent success rates, while the exact role for incision and drainage and aspiration should be further explored in adequately designed prospective studies. Given the higher (albeit still small) proportion of treatment complications in the incision and drainage group, a more conservative yet watchful approach towards PA might be advisable, but we are at present unable to define evidence-based strategies. Furthermore, incision and drainage emerged as a preferential management choice for management failures independently of the original therapeutic choice. Therefore, incision and drainage might be recommended as a salvage option for PA in the case of failure of aspiration or exclusive medical therapy.

**Conflict of interest statement**

The authors declare no conflict of interest.

**Funding**

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

**Authors’ contributions**

AMS and FA: study design, article search and selection, data extraction. TA, JRL, MM-Y and KP: drafting of the article. CMC-E: study design and critical revision of the article.

**Ethical consideration**

No formal ethics committee approval was required for this article as it is based on already published clinical data from other studies available in the literature.

**References**

1. Carbone PN, Capra GG, Brigger MT. Antibiotic therapy for pediatric deep neck abscesses: a systematic review. Int J Pediatr Otorhinolaryngol 2012;76:1647-1653. https://doi.org/10.1016/j.ijporl.2012.07.038

2. Tan VE, Goh BS. Parotid abscess: a five-year review - clinical presentation, diagnosis and management. J Laryngol Otol 2007;121:872-879. https://doi.org/10.1017/s0022215106004166

3. Thiede O, Stoll W, Schmål F. Clinical aspects of abscess development in parotitis. HNO 2002;50:332-338. https://doi.org/10.1007/s001060100544

4. Cheng L-H, Wang H-W, Lin C-M, et al. Parotid abscess: 15-year experience at a tertiary care referral center in Taiwan. J Med Sci 2019;39:231-235. https://doi.org/10.4103/jms.jms_15_19

5. Ganesh R, Leese T. Parotid abscess in Singapore. Singapore Med J 2005;46:553-556.

6. Brook I. The bacteriology of salivary gland infections. Oral Maxillofac Surg Clin North Am 2009;21:269-274. https://doi.org/10.1016/j.coms.2009.05.001

7. Franklyn J, Gaikwad P, Lazarus E, et al. Parotid abscess: a clinical analysis of 40 cases in a tertiary care hospital in India. J Oral Maxillofac Surg Med Path 2017;29:189-192.

8. Dahirmoghaddam P, Mohseni A, Navvahi Z, et al. Is ultrasonography-guided drainage a safe and effective alternative to incision and drainage for deep neck space abscesses? J Laryngol Otol 2017;131:259-263. https://doi.org/10.1017/s002221511700007x

9. Joo BY, Jang AL, Lee JH, et al. Application of ultrasound-guided pigtail catheter drainage for abscesses in the head and neck. Clin Otolaryngol 2017;42:1087-1091. https://doi.org/10.1111/coa.12864

10. Biron VL, Kurien G, Dziegielewski P, et al. Surgical vs ultrasound-guided drainage of deep neck space abscesses: a randomized controlled trial: surgical vs ultrasound drainage. J Otolaryngol Head Neck Surg 2013;42:18. https://doi.org/10.1186/1916-0216-42-18

11. Hassan A, Gaafer A. Surgical versus ultrasound guided aspiration or drainage of deep neck space abscesses: a randomized controlled trial. ALEXMED ePosters 2021;3:18-19. https://doi.org/10.21608/ALEXPO.2021.57390.1111

12. Liberati A, Altman DG, Tetzlaff J, et al. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate healthcare interventions: explanation and elaboration. BMJ 2009;339:b2700. https://doi.org/10.1136/bmj.b2700

13. National Heart, Lung, and Blood Institute (NHLBI). Study Quality Assessment Tools. https://www.nhlbi.nih.gov/health-topics/study-quality-assessment-tools. Accessed January 10, 2021.

14. Oxford Centre for Evidence-Based Medicine. The Oxford Levels of Evidence 2. https://www.cebm.net/index.aspx?o=5653. Accessed January 10, 2021.

15. Chi TH, Yuan CH, Chen HS. Parotid abscess: a retrospective study of 14 cases at a regional hospital in Taiwan. B-ENT 2014;10:315-318.

16. Cmejrek RC, Coticchia JM, Arnold JE. Presentation, diagnosis, and management of deep-neck abscesses in infants. Arch Otolaryngol Head Neck Surg 2002;128:1361-1364. https://doi.org/10.1001/archotol.128.12.1361

17. Daramola OO, Flanagan CE, Maisel RH, et al. Diagnosis and treatment of deep neck space abscesses. Otolaryngol Head Neck Surg 2009;141:123-130. https://doi.org/10.1016/j.otohns.2009.03.033

18. de la Cuesta FR, Cortes CE, Me GR, et al. [Deep neck space abscesses in children: 15 years of experience in a children’s ENT referral unit]. An Pediatr 2019;91:30-36. https://doi.org/10.1016/j.anpedi.2018.09.014

19. Jabłońska-Jesionowska M, Dąbeka-Rutkowska M, Kwasik P, et al. Parotitis in children hospitalized in the Department of Pediatric Otolaryngology of the Medical University of Warsaw in the years 2010-2017. New Med 2017;21:99-107. http://doi.org/10.25121/NewMed.2017.21.4.99

20. Kim YY, Lee DH, Yoon TM, et al. Parotid abscess at a single institute in Korea. Medicine 2018;97:e11700. https://doi.org/10.1097/md.0000000000011700

21. Lakshmi Narayana M, Azem Mohiyuddin SM, Mohammadi K, et al. Parotid abscess in children - A tertiary rural hospital experience. Int J Pediatr Otorhinolaryngol 2015;79:1988-1990. https://doi.org/10.1016/j.ijporl.2015.10.021
Laskawi R, Schaffranietz F, Arglebe C, et al. Inflammatory diseases of the salivary glands in infants and adolescents. Int J Pediatr Otorhinolaryngol 2006;70:129-136. https://doi.org/10.1016/j.ijporl.2005.06.012

Mahawerawat K, Kasemsiri P. Clinical presentation and treatment of melioidosis in the head and neck region. J Laryngol Otol 2018;132:827-831. https://doi.org/10.1017/s0022215118001391

Nusem-Horowitz S, Wolf M, Coret A, et al. Acute suppurative parotitis and parotid abscess in children. Int J Pediatr Otorhinolaryngol 1995;32:12-127. https://doi.org/10.1016/0165-5876(94)01120-m

Saarinen RT, Kolho KL, Pitkäranta A. Cases presenting as parotid abscesses in children. Int J Pediatr Otorhinolaryngol 2007;71:897-901. https://doi.org/10.1016/j.ijporl.2007.02.011

Stong BC, Sipp JA, Sobol SE. Pediatric parotitis: a 5-year review at a tertiary care pediatric institution. Int J Pediatr Otorhinolaryngol 2006;70:541-544. https://doi.org/10.1016/j.ijporl.2005.08.001

Wagner C, Sauermann R, Joukhadar C. Principles of antibiotic penetration into abscess fluid. Pharmacology 2006;78:1-10. https://doi.org/10.1159/000094668

Sader HS, Jacobs MR, Fritsche TR. Review of the spectrum and potency of orally administered cephalosporins and amoxicillin/clavulanate. Diagn Microbiol Infect Dis 2007;57:55-12S. https://doi.org/10.1016/j.diagmicrobio.2006.12.014

Blitz M, Britton KC. Management of the uncooperative child. Oral Maxillofac Surg Clin North Am 2010;22:461-469. https://doi.org/10.1016/j.coms.2010.08.002

Lee YJ, Jeong YM, Lee HS, et al. The efficacy of corticosteroids in the treatment of peritonsillar abscess: a meta-analysis. Clin Exp Otorhinolaryngol 2016;9:89-97. https://doi.org/10.21053/coe.2014.01851

Chaudhary P, Chaudhary B, Munjewar CK. Parotid tuberculosis. Indian J Tuberc 2017;64:161-166. https://doi.org/10.1016/j.ijtb.2017.03.004