International Journal of Pediatric Otorhinolaryngology 77 (2013) 996–1001

Contents lists available at SciVerse ScienceDirect

International Journal of Pediatric Otorhinolaryngology

journal homepage: www.elsevier.com/locate/ijporl

Paediatric otogenic lateral sinus thrombosis: Therapeutic management, outcome and thrombophilic evaluation

Eva Novoa [a], Mihael Podvinec [a,b], Regula Angst [c], Nicolas Gürtler [a,b,*]

[a] Klinik für Hals-Nasen-Ohrenkrankheiten, Hals-Gesichtschirurgie, Kantonsspital Aarau, Switzerland
[b] ENT-Research Group, HNO-Universitätsklinik, Universitätspital Basel, Switzerland
[c] Kinderklinik, Kantonsspital Aarau, Switzerland

ARTICLE INFO

Article history:
Received 18 January 2013
Received in revised form 27 March 2013
Accepted 28 March 2013
Available online 29 April 2013

Keywords:
Lateral sinus thrombosis
Otitis media
Anticoagulation
Mastoidectomy
Prothrombotic factors

ABSTRACT

Objective: Otogenic lateral sinus thrombosis (LST) in children represents a serious condition with potential long-lasting morbidity. The role of adjunct anticoagulation therapy and the benefit of an analysis of prothrombotic factors are unclear. The aim of the study was to report therapeutic management and outcome, analyze prothrombotic factors in children with otogenic LST treated with mastoidectomy/antibiotics/anticoagulation and to evaluate the results with a review of the literature.
Methods: Retrospective chart review of 9 children with otogenic LST (2000–2009) and literature search in PubMed.
Results: The most frequent sign was fever in 88%, while neurologic findings were seen in 55%. Streptococci was the most common bacteria (55%). Prothrombotic factors were normal in all children. All patients received therapeutic anticoagulation, without experiencing bleeding complications. Eight children made a full recovery, neurologic sequelae persisted in one. The literature review of 115 children identified fever as the most prominent sign, reported the absence of neurologic findings in almost 50% of cases and confirmed the major role of streptococci. Anticoagulation, as adjunct therapy, was given to 38% of patients in the therapeutic range with a trend towards better neurologic outcome. A prothrombotic analysis was reported in 5 studies with positive results in 2.
Conclusions: Surgery and antibiotics represent the mainstay of the therapy. Anticoagulation can be safely added in view of the high potential for morbidity and might reduce neurologic sequelae. Bacteria with thrombotic activity seem to be an important aetiology. In contrast, a prothrombotic disposition seems to play a minor role in the development of otogenic LST.

1. Introduction

Lateral sinus thrombosis (LST) constitutes a known complication of acute otitis media with mastoiditis. The incidence of LST has sharply declined since the advent of antibiotics, but mortality of up to 10% has not changed [1]. Both computer tomography and more specifically magnetic resonance venography are the preferred diagnostic methods for identifying LST [2].

The thrombosis can impair cerebrospinal fluid resorption and lead to raised intracranial pressure, known as otitic hydrocephalus. Although neurological symptoms are seen more frequently in LST of other origin than mastoiditis and disappear in the majority of cases, persistence of cognitive and motor skills impairment has been reported in up to 15% of cases [3]. While the therapy consisting of intravenous antibiotics and mastoidectomy is widely accepted, the role of the adjunct therapy with anticoagulants is under debate. Anticoagulation should prevent propagation of the thrombus to adjacent sinuses and jugular vein, help resolve the thrombus and prevent long-term side effects of an occluded lateral sinus. Additional support for advocating this therapy is the report on findings of prothrombotic factors in children with otogenic LST, which are considered to be a risk factor [4–6]. Anticoagulation has been reported to be safe in children. However, its real benefit is unclear due to the low number of patients, pooling of patients with different origins of LST and a variety of anticoagulant therapies [3,5,7–12]. The goals of this study are to report the outcome of children with LST due to mastoiditis treated with antibiotics, mastoidectomy and anticoagulants, analyze prothrombotic factors, which would render a child susceptible for development of LST, and review the specific literature.

* Corresponding author at: Klinik für Hals-Nasen-Ohrenkrankheiten, Hals-Gesichtschirurgie, Kantonsspital, 5001 Aarau, Switzerland.
Tel.: +41 62 838 4141; fax: +41 62 838 5109.
E-mail address: nicolas.guertler@usz.ch (N. Gürtler).

0165-5876/$ – see front matter © 2013 Elsevier Ireland Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.ijporl.2013.03.030

2. Materials and methods

A review of medical records of all children (less than 16 year of age) with acute or subacute mastoiditis with lateral sinus thrombosis confirmed by contrast-enhanced computer tomography (CECT) of the head and temporal bone, that were hospitalized at the Clinic of Otolaryngology at the Kantonsspital Aarau, Switzerland between 2000 and 2009, was performed. The various symptoms and the onset as well as otologic, neurologic and ophtalmologic findings at admission were noted. Laboratory analysis included infectious parameters, leucocyte count and C-reactive protein, and, as part of the routine evaluation, prothrombotic factors: Factors V, factor V Leiden mutation, VIII, XI, and XII, homocystein, von Willebrand activity, lipoprotein a, Anti-beta 2-GPI, antiphospholipid antibodies, plasminogen activator inhibitor-1, lupus anticoagulants, anti-cardiolipin antibodies, prothrombin mutation, fibrinogen, antithrombin III, Protein C and S deficiency. The Cantonal Ethics Committee of Aarau, Switzerland, granted approval of the study.

All children were treated by mastoidectomy with insertion of tympanostomy tubes, antibiotics and anticoagulation and were seen by an ophthalmologist for signs of increased intracranial pressure. The results of the ear cultures as well as type and duration of antibiotic treatment were collected. Weight-adapted therapeutic anticoagulation was performed primarily in all patients with unfractionated heparin (UFH) or low molecular weight heparin (LMWH). After hospitalization the patients were followed up clinically and by radiological imaging and hearing was assessed by pure-tone audiometry. The literature was searched for studies of paediatric otogenic infections with LST, which included more than 5 children, reported in the last 20 years. Studies reporting fewer than 5 children were regarded as case studies and excluded. Language was no exclusion criteria. The following MESH-Terms were used in combination "and/or": lateral sinus thrombosis, otogenic, mastoiditis, children.

3. Results

Nine children were included in this study, 3 female and 6 male, ranging from 1 to 13 years of age (mean 6.1). Acute (<3 weeks) and subacute otitis media (>3 weeks <2 months) were diagnosed in seven and two children, respectively. A history of recurrent otitis media requiring frequent antibiotic treatment was present in 3 children; recent varicella infection was reported in 1 and pollen allergy in 2 patients.

The most common clinical findings at admission were fever (88%), otalgia (77%) and otorrhoea (55%). Neurologic findings suggesting increased intracranial pressure (headache, vomiting and apathy) could be identified in 4 children (44%). Diplopia with palsy of the sixth cranial nerve was seen in 2 (22%) and vertigo in 1 patient (11%). Ophthalmologic examination yielded signs of otitic hydrocephalus in 4 patients (44%) (Table 1). Blood analysis revealed leucocytosis (WBC $> 10 \times 10^9$/L) in 7 (77%) and a reactive thrombocytosis (thrombocytes $> 600 \times 10^9$/L) in 4 children (44%). Levels of C reactive protein over 10 mg/ml were present in 5 patients (55%).

Table 1
Symptoms and clinical findings at presentation.

Clinical findings	*n*	%	Neurological findings	*n*	%
Fever	8	88.9	Apathy	4	44.4
Otalgia	7	77.8	Otitic hydrocephalus	4	44.4
Mastoid pain, swelling and erythema	6	66.7	Vomiting	4	44.4
Otorrhoe	5	55.6	CN VI Palsy	2	22.2
Pinna displacement	2	22.2	Headache	2	22.2
Descensus of the posterior EAC wall	1	11. 1	Vertigo	1	1.1

EAC, external ear canal; CN, cranial nerve.

All analyzed factors for prothrombotic predisposition were within normal range in all children. Only one factor (factor VIII) was temporarily elevated in one child.

Cultures from ear and mastoid tissue yielded streptococcus species in 5 children (55%), turicella otitidis in one patient (11%) and no bacterial growth in 3 cases (33%).

All children with clinical suspicion of mastoiditis underwent a CECT of the head in order to rule out further intracranial complications. CECT showed LST confined to the sigmoid sinus in 5 (55%), extending to the proximal jugular vein in 3 cases (33%) and the transverse sinus in 1 child (11%). A complete occlusion of the sigmoid sinus was radiologically diagnosed in 3 patients (33%) and partial in 6 (67%). Additionally, 4 (44%) subperiostal and 2 (22%) epidural abscesses were diagnosed. Sinus thrombosis was identified in the right side in 5 (55%) and in the left in 4 (44%) children. The five cases with an affected right side showed a partial sinus thrombosis and had following neurologic findings: abducens palsy (2, 22%) and otitic hydrocephalus (3, 33%). Only one neurologic deficit (otitic hydrocephalus) was seen on the left side with complete thrombosis. All children underwent a mastoidectomy with insertion of tympanostomy tubes within the first twenty-four hours following the diagnosis. Granulation tissue and purulence in the mastoid and antrum were observed in all patients and in 7 (77%) an additional bony dehiscence over the sigmoid sinus was present. The sigmoid sinus was widely decompressed by removing the inflamed perisinus tissue and its remaining bony shell. A complete thrombosis was confirmed in 4 (44%) and partial in 5 children (55%) by needle aspiration.

Prior to admission, Amoxicillin-Clavulanate (AMC-CL) was given to 7 children during a period of 1–21 days. According to the recommendation of the infectiologist, an inpatient therapy with Ceftriaxon in combination with AMX-CL was given to 6 children (78%) and Clindamycin to two (22%). AMX-CL in combination with metronidazole was given to 1 patient. The total duration of the antibiotic therapy was 17–31 days, with a mean of 21.5 days. Results from bacterial swabs did not necessitate changes in antibiotic treatment in any of the cases.

Anticoagulation was started postoperatively according to the paediatric haematologist in eight children, while in one case, with extensive thrombosis reaching the proximal internal jugular vein, it was begun immediately after the imaging diagnosis. Anticoagulation was given over a period of 4.2 months (3–11 months) and stopped after resolution of clinical symptoms and/or sinus recanalization.

Anticoagulation therapy consisted in LMWH (200IU/Kg/d) over a 3 month period in 6 children. The remaining three patients initially received UFH for 2, 7 and 21 days respectively, which was followed by LMWH for 3 months in the first, acetylsalicylate (3.5 mg/kg/d) for 6 months in the second and phenprocoumon during 11 months in the third patient.

Levels of anticoagulation were measured with anti-factor Xa, thrombin or prothrombin time in order to maintain constant therapeutic levels. Anticoagulation was well tolerated with no bleeding complications. Two children (22%) presented with a mild thrombocytopenia in the first week. In one child a persistent mild decrease at 192×10^9/L prompted a discontinuation of UFH and introduction of acetylsalicylate. In the second child, treatment with LMWH was stopped for one day and resumed afterwards with normal values. Follow-up magnetic resonance imaging with venography (MRI-MRV) was performed every 3 months for a maximum duration of 24 months in order to monitor re-canalization. Re-canalization of the sinus was observed in 7