doi: 10.48095/cccsnn2024337

Facial nerve lesions in children – a 10-year retrospective study in a tertiary center

Léze lícního nervu u dětí – 10letá retrospektivní studie v terciárním centru

Redakční rada potvrzuje, že rukopis práce splnil ICMJE kritéria pro publikace zasílané do biomedicínských časopisů.
The Editorial Board declares that the manuscript met the ICMJE "uniform requirements" for biomedical papers.

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Accepted for review: 3. 11. 2023
Accepted for print: 12. 9. 2024

Abstract

Aim: This study aimed to analyze the different characteristics of FNLs in children focusing on demographics, etiology, diagnostic and therapeutic process, improvement after therapy, and relapse rate in a tertiary center. *Materials and methods:* A retrospective study of 572 children (0 to 18 years) who were admitted to the University Hospital with facial nerve lesion (FNL) during a 10-year period (2011–2021). The data were gathered from patients´ medical files to analyze age, sex, side of FNL, etiology, the diagnostic process including radiological examinations, treatment methods, improvement after therapy, and relapse rate. *Results:* There were 554 unilateral and 18 bilateral cases without significant laterality differences. Girls were affected in 301 (52.6%) cases and boys in 271 (47.4%) cases. The median age was 9.4 ± 4.7 years. The mean House-Brackmann (HB) score was 3.6 ± 1.0. Two main causes whose representation was balanced were detected. Infectious causes occurred in 264 (46.2%) cases and idiopathic causes occurred in 255 (44.6%) cases. Borreliosis was the most common infectious cause in 216 (81.8%) cases. The third most common cause was of neoplastic origin in 15 (2.6%) cases. The following causes were traumatic, congenital, and others. Incomplete FNL was detected in 556 (97.2%) cases and complete FNL was found in 16 (2.8%) cases. Corticosteroids were administered in 360 patients, and antibiotics/ antivirals were given to 311 patients. Surgery was performed in 26 patients. 94.7 % of patients showed improvement after therapy while 5.3% did not, and 1.0% had an unknown outcome. For the infectious causes, improvement after therapy was seen in 99.2% of patients and idiopathic causes saw improvement in 98% of patients. Patients with infectious, idiopathic, and traumatic causes of paresis had a higher percentage of recovery compared to patients with neoplastic causes. *Conclusions:* FNL in children is a relatively common acute condition in pediatric care. Many different causes of FNL were described, the most common being infectious and idiopathic. A detailed clinical history and clinical examination are mandatory. Corticosteroids and antibiotics are most commonly prescribed medicaments. Opinions on the treatment remain controversial. The prognosis of FNL in children is usually favorable.

Key words

facial nerve lesions – children – clinical outcome – neuroborreliosis – treatment – prognosis

Klíčová slova

paréza lícního nervu – děti – klinické výsledky – neuroborelióza – léčba – prognóza

Introduction

Acute facial nerve lesion (FNL) is characterized by the sudden onset of facial weakness or paralysis. Although the recovery rates are high in the pediatric population, FNL can lead to serious functional and aesthetic problems. Impairment of verbal communication, oral competence, taste, or ocular function may occur, as well as potential psychological distress [1,2]. These aspects raise serious concerns among parents and require rapid diagnosis and appropriate treatment. The aim of this study was to present our 10-year experience with demographics, etiology, diagnostic process, treatment methods, and relapse rate of children diagnosed with FNL at the tertiary pediatric center.

Patients and methods

This long-term retrospective study was conducted over a decade at the tertiary referral pediatric center. Between 2011 and 2021, 572 children (aged 0–18 years) with FNL were admitted and diagnosed. Medical records were analyzed to collect data on age, sex, side of FNL, etiology, diagnostic process, treatment, improvement after therapy, and relapse. The grade of FNL was evaluated according to the House-Brackmann (HB) scale. All patients underwent laboratory tests (blood count and general blood chemistry), blood pressure tests, and neurological

Souhrn

Cíl: Cílem této studie bylo analyzovat klinické aspekty diagnostiky a léčby léze lícního nervu (LLN) u dětí v terciálním centru. Zaměřuje se na demografii, etiologii, diagnostický a terapeutický proces, míru úpravy po terapii a rozsah relapsů. *Materiál a metodika:* Retrospektivní studie, 572 pacientů (0–18 let), léčených ve fakultní nemocnici s diagnózou LLN v průběhu 10 let (2011–2021). Data byla získávaná z pacientské dokumentace. Analyzovány byly následující parametry: věk, pohlaví, strana léze, etiologie, diagnostický proces zahrnující radiologické vyšetření, léčebný proces, úprava léze po terapii a míra relapsu. *Výsledky:* LLN se vyskytla v 554 případech jako unilaterální, v 18 jako bilaterální bez signifikantní stranové diference. Dívky byly postiženy v 301 (52,6 %) a chlapci v 271 (47,4 %) případech. Medián věku byl stanoven na 9,4 ± 4,7 roku. Průměrné House-Brackmann (HB) skóre bylo 3,6 ± 1,0. Jako dvě nejčastější příčiny jsme prokázali infekční 264 (46,2 %) a idiopatickou 255 (44,6 %). Borelióza byla nejčastěji zastoupenou infekční příčinou u 216 (81,8 %) případů. Třetí nejčastější příčina byla neoplastická u 15 (2,6 %) případů. Následovaly traumatická, kongenitální a další. Nekompletní paréza byla detekována u 556 (97,2 %) případů a kompletní u 16 (2,8 %). Kortikosteroidy byly podány u 360 pacientů, antibiotika/antivirotika u 311 pacientů. Chirurgický výkon podstoupilo 26 pacientů. Úpravu po terapii jsme zaznamenali u 94,7 % pacientů, nezaznamenali u 5,3 %, u 1 % je údaj neznámý. U infekční příčiny prokázalo úpravu po terapii 99,2 %, u idiopatické 98 % pacientů. Pacienti s infekční, idiopatickou a traumatickou příčinou měli vyšší míru úpravy po terapii než pacienti s neoplastickou příčinou. *Závěr:* LLN je relativně častá akutní diagnóza v dětském věku. Bylo popsáno velké množství různých příčin, nejčastěji se vyskytuje příčina infekční a idiopatická. Pro správnou diagnózu je důležitá detailní anamnéza a klinické vyšetření. V léčbě převažuje terapie kortikosteroidy a antibiotiky. Názory na léčbu jsou kontroverzní. Prognóza LLN u děti je zpravidla dobrá.

examinations. Ear, nose, and throat (ENT) and ophthalmological examinations were performed in most patients. Most patients underwent serological testing. Serum and cerebrospinal fluid (CSF) samples were analyzed using enzyme-linked immunosorbent assay (ELISA) and chemiluminescence immunoassay (CLIA) methods to detect specific antibodies, where the positivity was confirmed by western blot (WB). If neuroborreliosis (NB) was suspected, a lumbar puncture was performed.

Imaging techniques such as X-ray, CT, MRI, and US examination were used in specific cases. Treatment was determined by the underlying cause of the FNL. It mostly consisted of corticosteroid (CS), antibiotic, or antiviral therapy. Some patients underwent surgery when indicated. Patients received rehabilitation including physiotherapy, laser therapy, magneto-therapy, or electrotherapy.

Standard descriptive statistics were used in the analysis; absolute and relative frequencies for categorical variables and mean were supplemented by standard deviation for continuous variables. The statistical significance of the relationships between categorical variables was calculated using the Fisher exact test; the statistical significance of differences in continuous variables between patient categories was analyzed using the Kruskal-Wallis test. Pearson and Spearman correlation coefficients and their statistical significance were used to analyze the relationship between continuous variables. Statistical analysis was computed using SPSS 22.0.0.0 (IBM, Armonk, NY, USA), and a = 0.05 was adopted as the level of statistical significance in all analyses.

Results

Demographics

Out of a total of 572 patients diagnosed with FNL and admitted to our hospital, 271 (47.4%) were boys and 301 (52.6%) were girls. The right side was affected in 293 (51.2%) cases and the left side in 261 (45.6%) cases. Both sides were involved in 18 (3.1%) cases. The median age (range 0–18 years) was 9.4 ± 4.7 years. Category 0–5 years 132 (23.1%) patients, category 6–12 years 275 (48.1%) patients, and category 13–18 years included 165 (28.8%) patients. The mean HB score was 3.6 ± 1.0, indicating a moderate facial nerve lesion on average. The primary outcome was available for all patients, and the secondary outcome (information about recovery and relapse) at the end of therapy was available for 554 patients (96.9%).

Etiology

Patients were divided into groups according to the cause of the lesion (Tab. 1). The largest group was infectious, with 264 (46.2%) cases. Borreliosis was detected in 216 (81.8%) cases. NB with evidence of *B. burgdorferi* was detected in CSF in 205 patients, and evidence of *B. burgorferi* was detected in serum without neuroinflammation in 11 patients. In 16 patients, the signs of inflammation in the CSF were detected without evidence of a pathogen. In view of the high incidence of borreliosis, it can be assumed that the pathogen was simply not detected so we included these patients as an infectious cause, but not as borreliosis. Otitis media and mastoiditis were detected in 19 (7.2%) cases.

Idiopathic facial nerve lesion (IFNL) was described in 255 (44.6%) cases, neoplastic causes in 15 (2.6%) cases, traumatic (iatrogenic, craniocerebral trauma) causes in 13 (2.3%) cases, congenital causes in 10 (1.7%) cases, and other (vascular, neurological, autoimmune, etc.) causes in 15 (2.6%) cases.

Upper/lower motor neuron involvement

Incomplete FNL was detected in 556 (97.2%) cases and complete one in 16 (2.8%) cases. All cases of infectious lesion manifested peripherally. Out of 255 idiopathic cases, 254 (99.6%) exhibited a peripheral lesion, while one (0.4%) presented with a central lesion. Among 15 cases of neoplastic causes, nine (60%) presented as central and six (40 %) as peripheral. Out of 10 congenital cases, eight (80%) had peripheral lesions, and two (20%) had central lesions. All 13 traumatic cases presented with a peripheral lesion. In the category others, four presented with a central lesion mainly of vascular etiology. The results were statistically significant for all categories except traumatic causes (Tab. 2).

Imaging methods

Radiological imaging was used in 343 patients (60%). X-ray was the most common method, used in 248 (43.4%) cases. Although X-ray was the most frequent, it did not prove to be a beneficial method in the diagnosis of FNL and its use is gradually decreasing. CT scan was used in 88 (15.4%) cases, and temporal bone fracture was detected in four (0.7%) cases. MRI was used in 82 (14.3%) cases, and ultrasound was used in eight (14%) cases.

Treatment

In the majority of patients, 360 (62.9%) received CS and 311 (54.4%) received antibio-

Tab. 1. Distribution of patients by etiology of FNL.

Etiology of FNL	N
Infectious	264
Borreliosis*	216
mastoiditis	19
Suspected borreliosis**	16
VZV	4
Sinusitis	2
Neisseria meningitis (meningitis)	1
HSV	1
Influenza A	1
Enterovirus	1
Otitis externa	1
Tonsillitis acuta	1
Paramyxovirus (orchitis acuta)	1
Idiopathic	255
Traumatic	13
Iatrogenic – extirpation on the neck	8
Iatrogenic – st.p. myringoplasty	1
Cranial trauma	4
Neoplastic	15
Astrocytoma (2× left cerebellar hemisphere)	2
Atypical teratoid rhabdoid tumor (cerebellum)	1
Glioblastoma (unspecified location)	2
Medulloblastoma (posterior cranial fossa)	3
Diffuse pontine glioma (brainstem)	1
Ependymoma (supratentorial region)	2
Ewing sarcoma (cranial base and right pyramid)	1
Brainstem tumor (unspecified)	1
Craniopharyngioma (retrosellar and suprasellar)	1
Primitive neuroectodermal tumor (brainstem and mesencephalon)	1
Congenital	10
Others	15
Cholesteatoma	4
Neurovascular conflict	1
Transient ischemic attack	1
Renovascular hypertension	1
AML (acute myeloid leucaemia)	1
Demyelinisation of central nervous system	1
FSHMD	1
Guillain-Barré syndrom	1
Hemiplegic migraine	1
Brain ischemia	1
Lymfangioma	1
Neurofibromatosis	1
Total	**572**

*Borreliosis – evidence of *B. burgdorferi* in CSF in 205 patients, evidence of *B. burgorferii* in serum without neuroinflammation in 11 patients; **Suspected borreliosis – signs of inflammation in the CSF, without evidence of a pathogen in the CSF

AML – acute myeloid leucaemia; AOM – acute otitis media; CSF – cerebrospinal fluid; HSV – herpes simplex virus; FNL – facial nerve lesion; FSHMD – facioscapulohumeral muscular dystrophy; N – number; VZV – varicella zoster virus

tics/antivirals, while surgery was performed in a smaller proportion of 26 patients (4.5%). Rehabilitation was offered to 554 (96.9%) patients. The use of CS differed significantly according to the cause of the lesion. Idiopathic causes received CS more frequently, as seen in 74.9% of cases, where patients with infectious causes received CS less frequently in 55.9 %. Antibiotic/antiviral use varied significantly via cause of lesion. Infectious causes received these drugs most frequently, as seen in 90.9% of cases. The need for surgery also varied significantly by cause of the lesion, with neoplastic causes requiring surgery most often (Tab. 3a). From infectious causes, it was most often otitis media acuta (AOM)/mastoiditis (Tab. 3b). There was no significant association between surgery and HB score. Of the known cases, 94.7% showed

Tab. 2. Relationship between cause of lesion and upper/lower motoneuron involvement.

Cause of lesion	N	% of known cases				P-value
		Central		Peripheral		
infectious	264	0	0.00%	264	100.00%	**< 0.001**
idiopathic	255	1	0.39%	254	99.61%	**0.001**
neoplastic	15	9	60.00%	6	40.00%	**< 0.001**
traumatic	13	0	0.00%	13	100.00%	1.000
congenital	10	2	20.00%	8	80.00%	**0.029**
other	15	4	26.67%	11	73.33%	**< 0.001**
total	**572**	**16**	**2.80%**	**556**	**97.20%**	–

N – number

Tab. 3a. Relationship between cause of lesion and surgery.

Cause of lesion	N	Surgery (% of known cases)				P-value
		No		Yes		
infectious	264	253	95.83%	11	4.17%	0.841
idiopathic	255	254	99.61%	1	0.39%	**< 0.001**
neoplastic	15	7	46.67%	8	53.33%	**< 0.001**
traumatic	13	11	84.62%	2	15.38%	0.114
congenital	10	10	100.00%	0	0.00%	1.000
other	15	11	73.33%	4	26.67%	**0.003**
total	**572**	**546**	**95.45%**	**26**	**4.55%**	–

N – number

Tab. 3b. Relationship between infectious cause of lesion and surgery.

Cause of lesion – infectious	N	Surgery (% of known cases)				P-value
		No		Yes		
neuroborreliosis	216	216	100.00%	0	0.00%	**< 0.001**
AOM/mastoiditis	19	8	42.11%	11	57.89%	**< 0.001**
other	29	29	100.00%	0	0.00%	0.616
total	**264**	**253**	**95.83%**	**11**	**4.17%**	–

AOM – acute otitis media; N – number

Tab. 4a. Relationship between cause of lesion and improvement after therapy.

Cause of lesion	N (*)	Improvement after therapy (% of known cases)				P-value
		No		Yes		
infectious	264 (0)	2	0.76%	262	99.24%	**< 0.001**
idiopathic	255 (5)	5	2.00%	245	98.00%	**0.038**
neoplastic	15 (0)	11	73.33%	4	26.67%	**< 0.001**
traumatic	13 (0)	3	23.08%	10	76.92%	**0.042**
congenital	10 (1)	7	77.78%	2	22.22%	**< 0.001**
other	15 (0)	2	13.33%	13	86.67%	0.242
total	**572 (6)**	**30**	**5.30%**	**536**	**94.70%**	–

*number of cases with unknown improvement after therapy
N – number

Tab. 4b. Relationship between infectious cause of lesion and improvement after therapy.

Cause of lesion – infectious	N	Improvement after therapy (% of known cases)				P-value
		No		Yes		
neuroborreliosis	216	0	0.00%	216	100.00%	**0.032**
AOM/mastoiditis	19	0	0.00%	19	100.00%	1.000
other	29	2	6.90%	27	93.10%	**0.012**
total	**264**	**2**	**0.76%**	**262**	**99.24%**	–

AOM – acute otitis media; N – number

improvement after therapy, while 5.3% did not; six patients had an unknown outcome. For the infectious causes, improvement after therapy was seen in 99.2% of patients and idiopathic causes had improvement in 98% of patients. For NB and AOM/mastoiditis, improvement after therapy was seen in 100% of patients. In contrast, patients with a neoplastic and congenital cause presented with a low rate of improvement after therapy. The results were statistically significant for all categories (Tab. 4a, b).

Relationship between HB, etiology, age, and relapses

The mean HB values for the different causes of lesions (infectious, idiopathic, neoplastic, and traumatic) were similar, with no statistically significant differences observed (Fig. 1). There was no significant correlation between age and HB score, indicating that age does not significantly influence the degree of disability. Patients with infectious and idiopathic causes of lesions had a higher percentage of relapse than patients with neoplastic or traumatic causes. The differences were statistically significant for infectious and idiopathic causes (Tab. 5a) and NB (Tab. 5b). There were significant differences in the ages of patients with different causes of lesions (Tab. 6, Fig. 2). Patients with idiopathic causes were older than those with infectious causes. However, there was no significant difference in age between patients with neoplastic or traumatic causes and those with infectious causes.

Discussion

FNL occurs less frequently in children than in adults. According to the literature, the incidence in children varies from 5 to 21/100,000 per year [3,4]. The average age of a child affected by FNL is between 5 to 11 years, with no laterality preference [3,5–7]. The average age in our study was closer to the upper limit. Most studies describe FNL as unilateral [3,7,8] and without significant sex differences [5,7], which corresponds to our findings.

Acquired and congenital causes of FNL have been reported. Acquired FNL can be idiopathic, also known as Bell's palsy, which was first described in 1821 by a Scottish surgeon named Charles Bell [8]. This condition is usually unilateral and has a rapid onset. Several possible hypotheses for Bell's palsy have been proposed. Exposure to cold, pa-

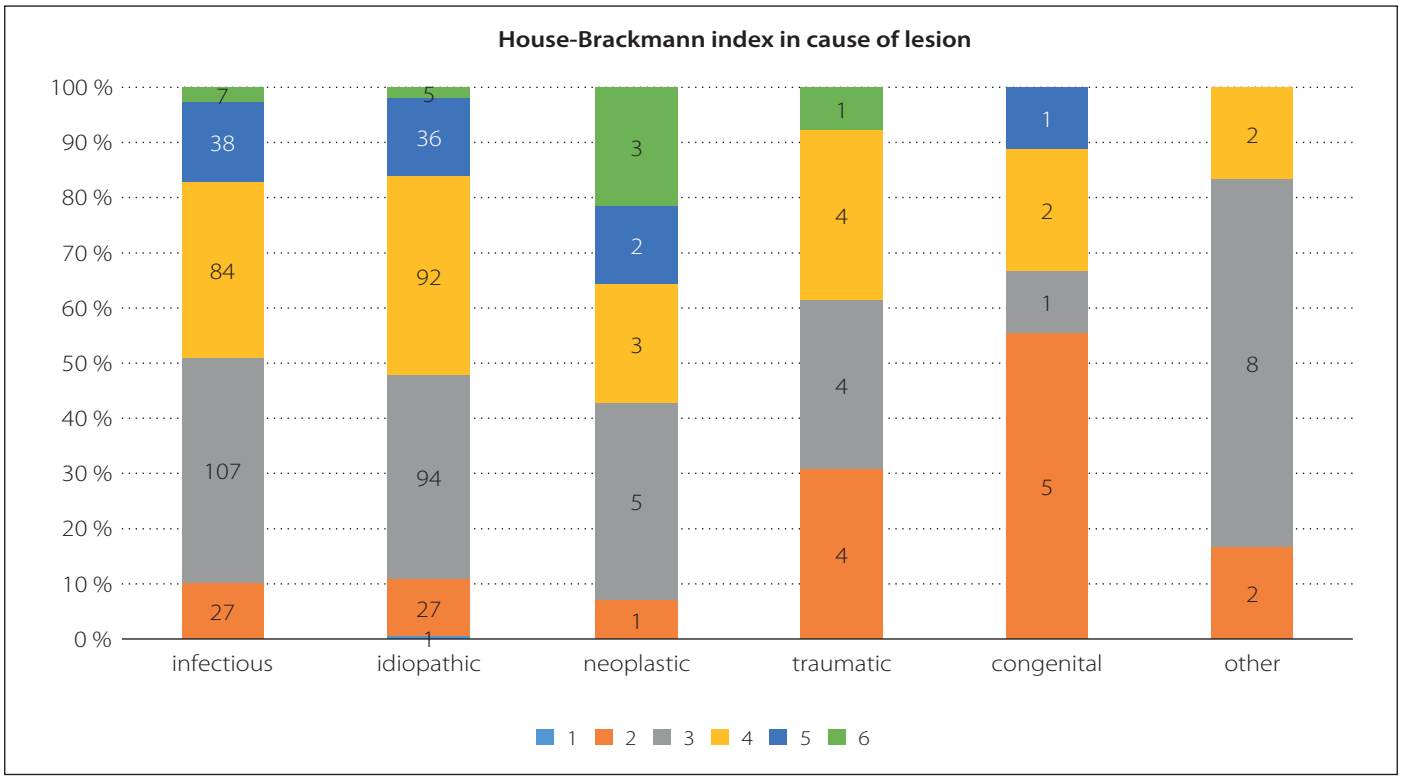

Fig. 1. Relationship between cause of lesion and House-Brackmann index.
Obr. 1. Vztah mezi příčinou léze a House-Brackmann indexem.

ralysis e frigore is often associated with fever, chills, neck pain, and swelling. The ischemic hypothesis considers the cause to be impaired circulation of the vasa nervorum. The viral hypothesis associates FNL with presence of the herpes simplex virus (HSV). Murakami et al. [9] demonstrated the presence of viral HSV DNA in endoneurial fluid and muscle. The mechanism remains unclear. Multiple studies have reported IFNL as the most common cause of FNL in children [10]. Wolfovitz et al. reported this in 56 (77.8%) cases, Shih et al. in 44 (78.6%) cases, or Psillas et al. in 109 (87.9%) cases. In our study, IFNL was detected as the second most common cause in 255 (44.6%) cases.

Another common cause of FNL in children is infectious [1]. In the past, acute bacterial otitis media was considered the main infectious cause of FNL in children, mainly due to anatomical and immunological factors. However, the use of antibiotics and vaccination has reduced its incidence [11]. The viral cause of FNL is now of increasing importance whether it is HSV with possible association with Bell's palsy [12] or other viruses such as varicella zoster virus (VZV), cytomegalovirus (CMV), Epstein-Barr virus (EBV), HIV, rubella virus, mumps, influenza, echovirus, and coxsackievirus [13]. In our study, infec-

Tab. 5a. Relationship between the cause of lesion and relapse.

Cause of lesion	N (*)	Relapse (% of known cases)				P-value
		No		Yes		
infectious	264 (2)	256	97.71%	6	2.29%	**0.004**
idiopathic	255 (4)	232	92.43%	19	7.57%	**0.038**
neoplastic	15 (0)	13	86.67%	2	13.33%	0.183
traumatic	13 (0)	13	100.00%	0	0.00%	1.000
congenital	10 (1)	9	100.00%	0	0.00%	1.000
other	15 (1)	11	78.57%	3	21.43%	**0.039**
total	**572 (8)**	**534**	**94.68%**	**30**	**5.32%**	–

*number of cases with unknown relaps
N – number

Tab. 5b. Relationship between the infectious cause of lesion and relapse.

Cause of lesion – infectious	N	Relaps (% of known cases)				P-value
		No		Yes		
neuroborreliosis	211	209	99.05%	2	0.95%	**0.010**
AOM/mastoiditis	19	18	94.74%	1	5.26%	0.372
other	29	27	90.00%	3	10.00%	**0.014**
total	**259**	**254**	**97.69%**	**6**	**2.31%**	–

AOM – acute otitis media; N – number

Tab. 6. Relationship between the cause of lesion and age.

Cause of lesion	N	Age (mean ± SD)	P-value
infectious	264	8.19 ± 4.13	**< 0.001**
idiopathic	255	11.18 ± 4.61	**< 0.001**
neoplastic	15	7.8 ± 4.20	0.223
traumatic	13	9.08 ± 5.84	0.793
congenital	10	1.60 ± 1.90	**< 0.001**
other	15	8.40 ± 3.91	0.445
total	**572**	**7.71 ± 4.10**	–

N – number; SD – standard deviation

tious cause was the most common one for FNL in 263 (46.0%) cases.

Lyme disease (LD) has been reported as an important cause of FNL in endemic areas, which also includes the Czech Republic. Several studies have reported NB as the most common infectious cause in the pediatric population [5,14,15]. Bruinsma et al. reported this in 45 (43%) cases, Jenke et al. in 25 (23.5%) cases, and Kanerva et al. in 12 (32%) cases. This is consistent with our findings, where borreliosis was detected in 216 (37.7%) patients. LD is caused by the spirochaete Borrelia, transmitted by the bite of Ixodes ricinus. The manifestation of LD can be non-specific. Typical symptoms in the first phase are annular rash (erythema migrans), headache, arthralgia, myalgia, and fatigue. However, isolated FNL may be the first symptom and the disease may be misdiagnosed as Bell's palsy. In recent decades, the incidence of LD in the Czech Republic has been around 35 : 100,000 cases per year. The age-specific incidence has two peaks, one in the age group 5–9 years (50 : 100,000) and the other in the age group 55–64 years (57.9 : 100,000) [16].

Other causes of FNL have been described as traumatic, congenital, neoplastic, toxic, neuroinflammatory, and vascular. In equivocal cases and with ineffective or no response to treatment, it is necessary to rule out less common and more serious causes of FNL [13].

In children presenting with an acute facial nerve lesion, full clinical history, and a detailed physical examination are essential [17]. In areas where LD is endemic, a history of a tick bite, outdoor activities, and exclusion of LD symptoms are important in the differential diagnosis [11]. A full ENT examination including otoscopy, inspection of the mastoid region, audiogram, and neurological examination are recommended [11]. We also highly recommend an ophthalmological examination. Blood pressure measurement is also necessary, as arterial hypertension can be a rare cause of FNL in children [17]. We found one patient with arterial hypertension in our cohort. Some authors consider the complete blood count to be mandatory [10,18], especially because leukemia can also manifest as FNL, although this condition is not very common. We only included one such patient in our study.

Viral and bacterial serology from blood and CSF samples is recommended for infectious analysis. Lumbar puncture is necessary if NB or Guillain-Barre syndrome are suspected [18]. In our institution, the definitive diagnosis of NB requires the detection of specific antibodies in the CSF, lymphocytic pleocytosis, and clinical manifestation. Patients are diagnosed with NB and treated if at least two of the above criteria are met.

In certain cases, particularly those with neurological abnormalities or suspected malignancy, radiological imaging is an important part of the diagnostic process. MRI can detect brainstem pathology. High-resolution CT is important for the evaluation of the intratemporal portion of the facial nerve, particularly in case of trauma or in the diagnosis of AOM complications such as mastoiditis. Contrast-enhanced MRI (CE-MRI) can identify affected portions of the facial nerve in Bell's palsy, but its use in clinical practice is limited [17,18]. Electrophysiological anal-

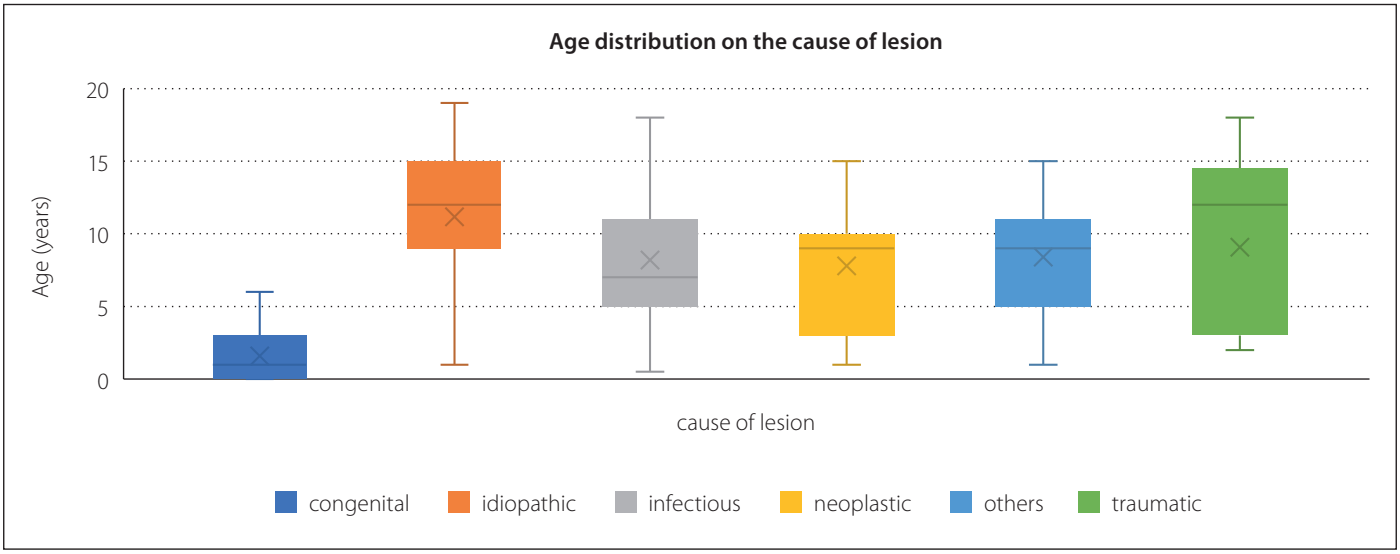

Fig. 2. Relationship between cause of lesion and age distribution.
Obr. 2. Vztah mezi příčinou léze a věkovou distribucí.

yses can provide prognostic information, help diagnose lesion severity, and guide decision-making, especially in traumatic cases [8,17].

Peripheral (incomplete) type of FNL was detected in most patients. The central (complete) type of lesion occurs mainly in adulthood, in association with cerebral ischemia. In children, it is a rare condition. We detected 16 (2.8%) cases in our cohort, mainly associated with brain tumors and vascular etiology. Studies concerning a central lesion in children are limited.

The management of FNL in children remains controversial [4,6,8]. It is highly dependent on the etiology and severity of the disease [11]. CS, antibiotics, and antivirals are the most commonly prescribed medications.

Several studies have shown that early use of CS (within 72 h) significantly improves the chances of complete recovery from IFNL in adults [19–21]. CS treatment of IFNL in children has been the subject of studies in recent years, but to date, there is no similar definitive evidence in the pediatric population. A recent study [22] did not find evidence that early treatment with prednisolone improved complete recovery of IFNL in children, but CS are commonly used in the treatment. As definitive treatment of IFNL in children is not available, the opinions on the use, dosage, and duration of CS treatment of IFNL remain inconclusive [23]. The dosage of CS ranges from 0.5–2 mg/kg/day of prednisone or 0.5 to 1.5 mg/kg/day of prednisolone [23], and the duration of treatment also varies from 5 to 10 days [11,22,23]. In our study, children were treated with prednisone at a dose of 1 mg/kg/day for 10 days. The effect of antivirals with or without CS in the treatment of IFNL in adults and children also remains unclear. Some authors have shown that the addition of antiviral therapy does not increase the rate of complete recovery [20,24]. The 2019 Cochrane review suggests that a combination of CS and antivirals may have a beneficial effect on the late sequelae of IFNL compared with CS treatment alone [25].

There is also ambiguity regarding the management of FNL treatment in the setting of NB [26]. Antibiotics are generally recommended even if NB is suspected [27], whereas the effect of CS remains unclear [28]. In our study, children diagnosed with NB or suspected of having NB were treated with the antibiotics ceftriaxone or doxycycline depending on age and season. CS were given to about half of the patients.

Management in the treatment of traumatic FNL also remains heterogeneous. The controversy concerns the indication of surgical treatment, timing of the surgery, or surgical approach [29]. Facial nerve decompression is generally recommended in case of immediate, complete FNL with no signs of regeneration in the first weeks after the lesion [30,31]. On the other hand, some authors are also skeptical of surgical decompression and suggest no superior outcomes in comparison to conservative nonsurgical treatment [32]. In our department, we perform decompression for a severe, sudden-onset FNL with the finding of transverse pyramidal fracture as soon as possible after the injury. In the case of temporal bone fracture with a low degree of FNL and gradual occurrence, conservative treatment is possible.

Compared with adults, children have a greater potential for neuroplasticity and the prognosis of FNL is usually favorable highly depending on the cause. IFNL tends to have a favorable prognosis in children [18]. This is consistent with our results. Recurrent FNL is not very common in the pediatric population [4]. In our study, we found 30 cases of FNL recurrence, mainly in the idiopathic group.

Conclusion

Facial nerve lesion in children has a median age of 9.4 years and a near-even sex distribution. The cause is most likely idiopathic or infectious. NB was proven to be the most common infectious cause. However, many different causes of FNL have been described. A detailed clinical history and clinical examination are necessary. In unclear cases, less common causes of FNL must be considered. The severity of FNL (HB score) was similar across various causes and there was no significant age-related influence on FNL severity. Notably, there were significant age differences among patients with different causes of FNL, with idiopathic cases generally being older, while age differences were less pronounced between other categories. Opinions on treatment are equivocal, but the prognosis of FNL is usually favorable.

Ethical principles

The study was conducted in accordance with the Declaration of Helsinki from 1975 (and its revisions from 2004 and 2008). The study is not subject to ethics committee approval; patients signed a consent form for the diagnostic and treatment process.

Funding

The authors received no financial support for the research, authorship and/or publication of this article.

Conflict of interest

The authors declare no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

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