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OCCLUSO-FACIAL MANIFESTATIONS IN A CHILD WITH THE RASMUSSEN SYNDROME AND INTERCURRENT LYME DISEASE – A CASE REPORT

OBJAWY ZGRYZOWO-TWARZOWE U DZIECKA Z ZESPOŁEM RASMUSSENA PRZY WSPÓŁISTNIEJĄCEJ BORELIOZIE – OPIS PRZYPADKU

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Abstract

The Rasmussen Syndrome (RS) is a rare neurological disease, usually diagnosed in the 1st decade of life, leading to damage of the central nervous system. It is characterised by sudden seizures in previously healthy children. In this paper we present a case of a 14-year-old female patient with malocclusion who reported to the orthodontic clinic to start orthodontic treatment. The first symptoms of nervous system disorders manifested when the patient was 8 years old. Until then, the patient had been developing correctly. The interview revealed that at the age of 9 the patient was diagnosed with Lyme disease and a long-term antibiotics therapy was started. At the age of 10, the Rasmussen syndrome was diagnosed (the antibiotics therapy was discontinued) and confirmed by magnetic resonance imaging (MRI) and histopathological examination after brain biopsy. The study focuses in particular on the changes in the craniofacial skeleton and oral cavity, taking into account dynamically developing and increasing occlusion defects. The ethical aspect of the treatment has also been considered.

Key words: Rasmussen syndrome, Lyme disease, occluso-facial disorders

Streszczenie

Zespół Rasmussena (RS) jest rzadko występującą chorobą neurologiczną rozpoznawaną zwykle w pierwszej dekadzie życia, prowadzącą do uszkodzenia ośrodkowego układu nerwowego. Charakteryzuje się nagłym wystąpieniem napadów drgawek u wcześniej zdrowych dzieci. W pracy przedstawiono przypadek 14-letniej pacjentki, która zgłosiła się z matką z powodu wady zgryzu celem podjęcia leczenia ortodontycznego. W 8. roku życia pojawiły się pierwsze objawy zaburzeń ze strony układu nerwowego. Dotąd dziecko rozwijało się prawidłowo. Z wywiadów uzyskano informacje, że w wieku 9 lat stwierdzono boreliozę i rozpoczęto długofalową terapię antybiotykową. W 10. roku życia postawiono rozpoznanie zespół Rasmussena (zaprzestano antybiotykoterapii), które potwierdzono badaniem MR i histopatologicznym. W pracy zwrócono szczególną uwagę na zmiany w obrębie szkieletu części twarzowej czaszki oraz jamy ustnej, uwzględniając dynamicznie pojawiające i nasilające się wady zgryzu, zwrócono także uwagę na etyczny aspekt leczenia.

Słowa kluczowe: zespół Rasmussena, borelioza, zaburzenia zgryzowo-twarzowe

INTRODUCTION

The Rasmussen syndrome (RS; synonyms: Rasmussen encephalitis, Rasmussen disease) is a rare neurological disease with unclear etiology, causing a progressive inflammatory process in the brain [1, 2].

The disease was described for the first time in 1958 by Theodore Brown Rasmussen. The first symptoms of RS usually develop in the 1st decade of life in previously healthy children. Clinical manifestations include epileptic seizures with gradual regression of cognitive functions, and neurological deficits, mainly hemiparesis [3, 4]. The disease onset rarely occurs past childhood, although a case of RS diagnosed in an adult (aged 29 yrs.) has been reported. It is believed that if the syndrome manifests in adulthood, it has a milder course and the final deficits are not as severe as in patients in the developmental period [5, 6]. The Rasmussen disease manifests as a result of incorrect functioning of the nervous system caused by disorders of one hemisphere (rarely both). Magnetic resonance imaging (MRI), a neuroimaging study of choice, displays unilateral hemispheric cortico-subcortical atrophy with widening of a lateral ventricle and pericerebral fluid spaces, in the region of the insula in particular. Atrophy of the head of the caudate nucleus is also usually observed. Cortical and subcortical hyperintense signal intensity may be visible in T2-weighted images, including SE(FSE) and FLAIR sequences [7, 8]. Follow-up studies show progression of the atrophy. Pathological changes observed in the brain involve lymphocyte infiltration and microglial nodules [3].

Numerous authors emphasize in their studies that despite an increasing number of proofs of an ongoing immunological process in patients, the etiopathogenesis of the disease is still unknown [2, 4, 5, 7].

The Rasmussen syndrome should be differentiated from the Kozhevnikov syndrome, in which the symptoms manifest since birth, the Parry-Romberg syndrome, the Sturge-Weber syndrome and the tick-borne encephalitis (TBE) [7, 9, 10].

The study reviews the current state of knowledge on the Rasmussen syndrome and presents an own case of a 14-year-old female patient from the perspective of dynamically progressing disorders in the craniofacial skeleton. It also pays attention to an ethical dilemma related to the surgical procedures proposed to patients with the Rasmussen syndrome.

Available literature in the PubMed database has been reviewed (key words: Rasmussen syndrome; Rasmussen encephalitis; Rasmussen disease). The papers included mainly case studies of neurological disorders and formation mechanisms of the Rasmussen syndrome, yet they lacked descriptions of craniofacial skeleton anomalies associated with the Rasmussen syndrome, therefore we present this aspect in the own case report.

CASE REPORT

The patient, aged 13, with the diagnosis of Lyme disease and then of Rasmussen syndrome, presented with her mother to a specialist consultation in the Orthodontic Clinic Department of the Institute of Mother and Child in Warsaw due to malocclusion. The information on the previously diagnosed disorders has been obtained from the medical history and documentation provided by the patient's mother. As regards genetic congenital defects, the perinatal and family history was negative. Heteroanamnesis revealed that the patient was born after 3rd pregnancy and 2nd labour (G3P2). The course of pregnancy history was unremarkable, the baby was delivered through Caesarean section as the waters broke prematurely and the foetus's pulse weakened. The birth weight was 3300 g, the body length was 51 cm. The newborn received the Apgar score of 10. The child was breastfed until the age of 2 years and fed with a spoon from the 6th month of life. The psychomotor development during infancy was normal, however in the 2nd month of life rehabilitation was commenced due to minor weakening of the muscle tone on the right side of the body. The child crawled correctly and started to walk in the 13th month of life. She started to ride a two-wheel bike unaided at the age of 6 years. In the first years of infancy, the child's intellectual development was normal, the patient additionally attended a music school (piano classes).

The first seizures occurred at the age of 8; Lyme disease was diagnosed. The MRI scan performed at that time did not show any focal changes typically present in the brain tissue in case of neuroborreliosis, however cortico-subcortical atrophy of the left cerebral hemisphere was observed – figure 1a, b. At first the seizures were rare, then their frequency increased despite the antibiotics therapy. With time the seizures developed into their full form and their frequency grew up to more than ten attacks per month. The cognitive functions were observed to regress gradually and hemiparesis of the right side progressed. Since the age of 10 yrs, the patient has been under multidisciplinary care. The diagnostics based on the imaging and laboratory tests suggested the Rasmussen syndrome. Subsequent MRI scans showed progression of the atrophic changes – figure 2 a, b. A detailed description of the changes in the central nervous system was based on the analysis of the MRI scans.

Brain biopsy revealed the characteristics of encephalitis and confirmed the diagnosis. Neuropsychological examination indicated decline in the intellectual and cognitive functions. Presently, the patient attends a primary inclusive school.

An orthodontic extraoral examination revealed lower tone of the facial muscles, especially on the right side, and noticeable hypotonia of the orbicularis oris muscle prevented the patient from closing the lips at ease – the so called lip incompetence. Asymmetrical facial features were present. The subnasal area and mentolabial sulcus were smoothed out, the oral fissure open (fig. 3 a, b, c).

The intraoral examination showed irregularities in the upper and lower dental arch, crowding of incisors, open bite in the anterior teeth and lateral sections. The tongue was flaccid, at ease laid low with a reflex of right-side thrusting between the dental arches (fig. 4a, b, c). Orthodontic heteroanamnesis indicated that at the age of 8 the girl was treated with a removable appliance due

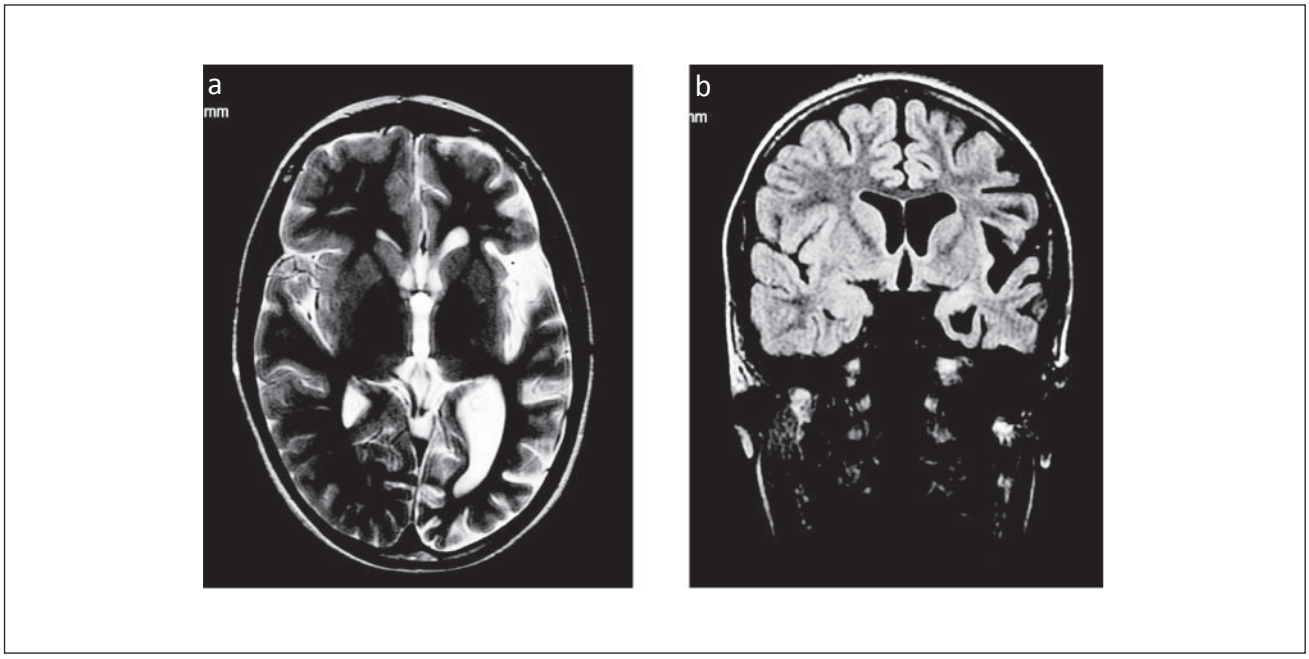

Fig. 1. Brain MRI of the presented patient at the age of 8 years. The volume of the left cerebral hemisphere is decreased due to the cortico-subcortical atrophy – this is seen as the widening of the left lateral ventricle and of the perice-rebral fluid spaces, in the region of the insula in particular. FSE/T2-weighted image, axial plane (a), FLAIR image, coronal plane (b).

Ryc. 1. Obraz MR pacjentki w wieku 8 lat. Zmniejszona objętość lewej półkuli mózgu spowodowana jej korowo-podkorowym zanikiem wyrażonym poszerzeniem komory bocznej i przymózgowych przestrzeni płynowych, szczególnie nasilonym w okolicy wyspy. Obraz T2-zależny w projekcji poprzecznej (a), obraz w sekwencji FLAIR w płaszczyźnie czołowej (b).

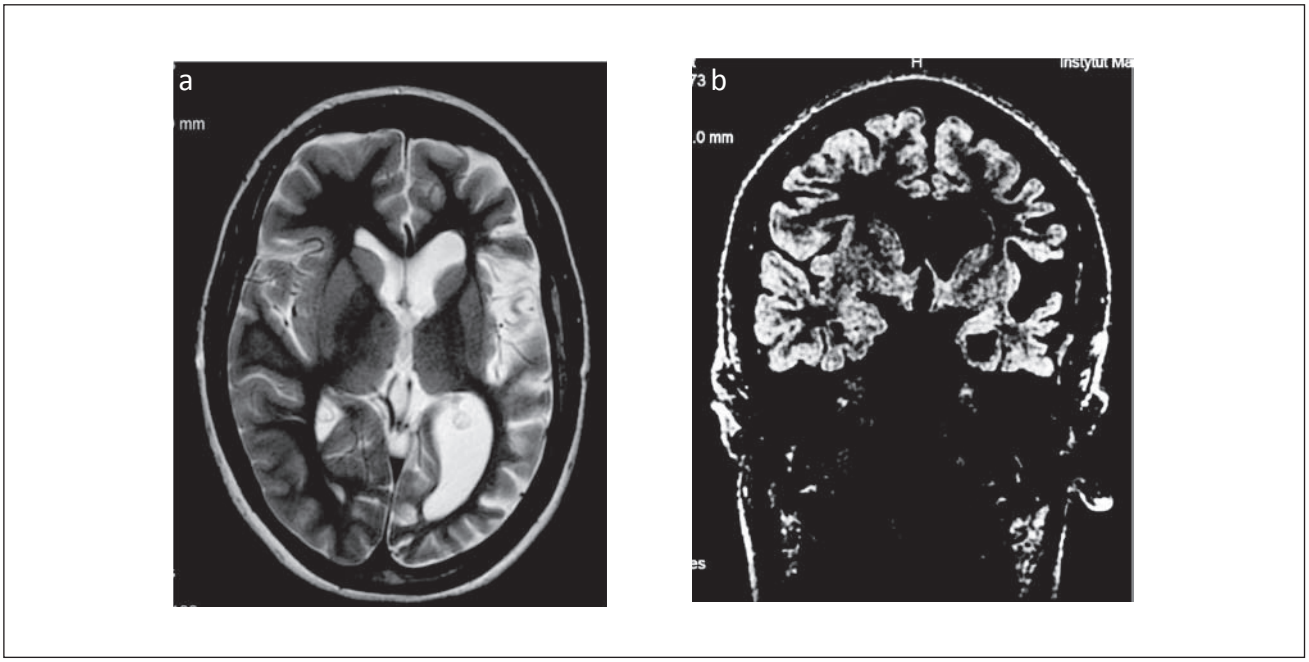

Fig. 2. Brain MRI at the age of 12 – progression of the changes. The same slices of the examination as in Figure 1: FSE/T2-weighted image, axial plane (a), CUBE,3D/FLAIR image, coronal plane (b).

Ryc. 2. Badanie MR w wieku 12 lat – progresja zmian. Te same warstwy badania w tych samych sekwencjach, co na rycinie 1 (a, b). Obraz T2-zależny w projekcji poprzecznej (2a), obraz w sekwencji FLAIR w płaszczyźnie czołowej 2(b).

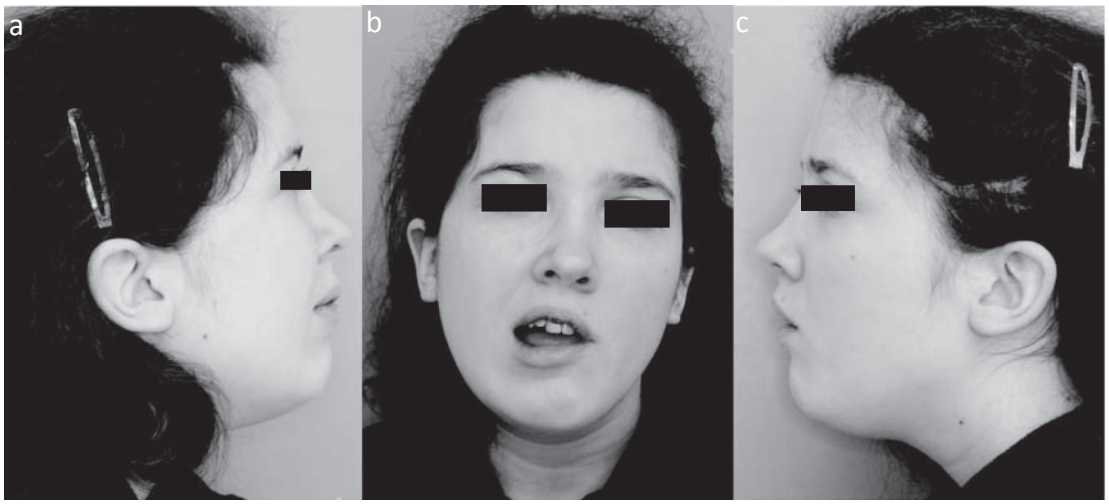

Fig. 3. Extraoral photos: a – right profile, b- en face, c- left profile.

Ryc. 3. Fotografie twarzy: a – profil prawy, b – en face, c – profil lewy.

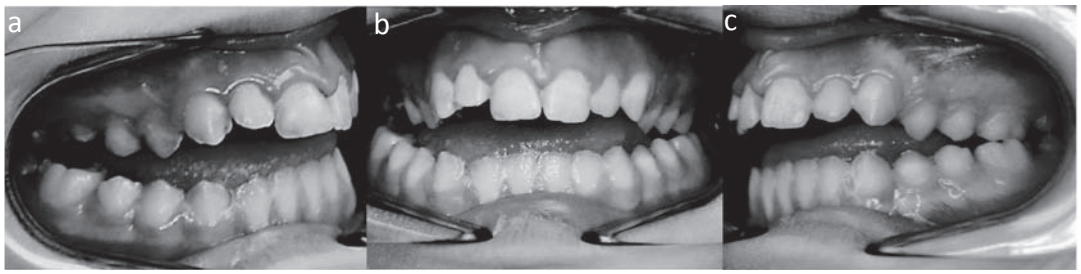

Fig. 4. Intraoral photos, occusal ralationships: a – right side, b – en face, c – left side.

Ryc. 4. Fotografie wewnątrzustne, warunki zgryzowe: a – po stronie prawej, b – en face, c – po stronie lewej.

to a diastema. The appliance was used for a few months. Family photographs of the patient's face provided by the mother and taken at various moments of life, showed that changes in the occlusion had began after the age of 10 and had been slightly more visible in the craniofacial skeleton after the age of 12. The changes were increasingly dynamic and involved the entire stomatognathic system over the last year.

The orthopantomogram taken at the age of 13 showed the presence of all permanent teeth along with the tooth buds of the 3rd molars, however the shape and the length of the mandibular rami were asymmetric (fig. 5). Cephalometric analysis of a lateral head teleroentgenogram revealed features characteristic of a skeletal open bite.

The analysis of the provided photographs of the patient's face with visible dentition (taken at the age of 5, 6 and 10) indicated correct occlusion, first of deciduous teeth, replaced by erupting permanent teeth in the lower anterior section, then of permanent upper incisors (fig. 6 a, b; fig. 7; fig. 8). A full-face photograph suggests a harmonious development of the facial features until the age of 10, i.e. no noticeable asymmetry of the facial muscles (fig. 8). Photographs of the patient's face taken after the age of 10 show not only a disturbed symmetry of the smile but also occlusal anomalies with a tendency towards bilateral cross bite in the lateral sections and an open bite in the anterior section (fig. 9). The current state indicates further dynamics of the distortion: deepened bilateral

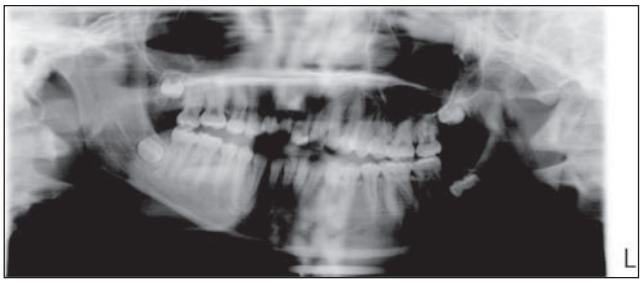

Fig. 5. Orthopantomogram at the age of 13 years showed the presence of all permanent teeth along with the tooth buds of the 3rd molars.

Ryc. 5. Pantomogram wykonany w 13. roku życia wykazał obecność wszystkich zawiązków zębów stałych.

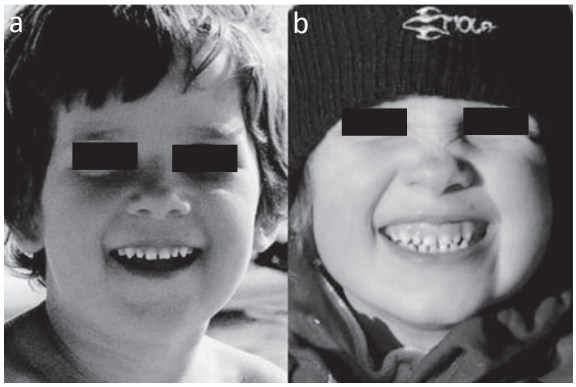

Fig. 6. Photos a and b from the family album at the age of five years.

Ryc. 6. Fotografie a i b z albumu rodzinnego w wieku 5 lat.

Fig. 7. Photos from the family album at age 6, materialized face and correct occlusal conditions.

Ryc. 7. Fotografie z albumu rodzinnego w wieku 6 lat uwidaczniające twarz i zęby – prawidłowe warunki zgryzowe.

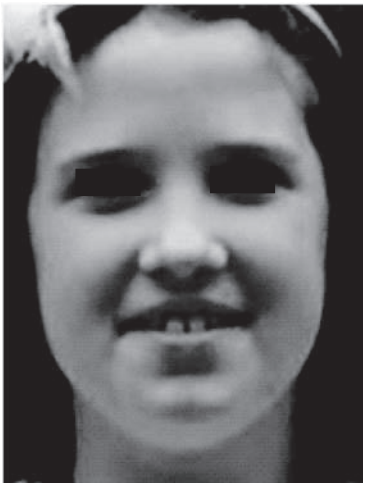

Fig. 8. Photos from the family album at age of 10 years.

Ryc. 8. Fotografie z albumu rodzinnego w wieku 10 lat.

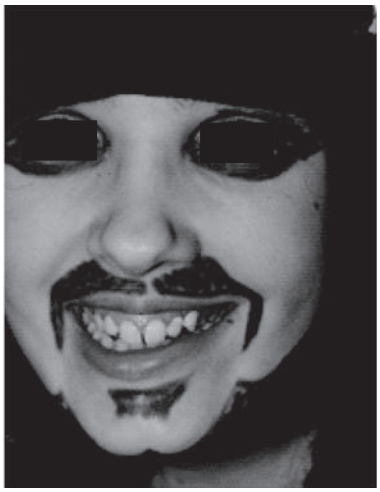

Fig. 9. Photos from the family album at age 12.

Ryc. 9. Fotografie z albumu rodzinnego w wieku 12 lat.

cross bite with a complete open bite definitively more severe on the right side in relation to the midline (fig. 3 a, b, c). A proposed trainer allows to maintain, as far as possible, a constant mutual relationship of the dental arches, yet it mainly blocks the tongue and prevents the tongue thrusting.

The treatment of the patient is very difficult. One of the options in closing a complete open bite is extraction of the teeth in the support zone. In such an advanced condition that would involve the 2nd and the 3rd molars, however we do not know in what direction and with what intensity the disorders caused by the basic disease, i.e. the

Rasmussen syndrome complicated by the Lyme disease, would develop, therefore that option does not guarantee a good result and the prognosis is uncertain.

DISCUSSION

The Rasmussen syndrome affects previously healthy subjects and changes their lives, and the lives of their families [4]. The incidence of this disease is extremely low. In an Argentinian study analysing the period of 22 years, 32 new cases were recorded, which renders the incidence at 1.5 patient per year [1]. In German observations, the nation-wide incidence was estimated at 2.4 cases annually per 10 million people below the age of 18 [11]. Prospective studies of Italian researchers covered 16 patients within the span of 16 years [2]. The British data estimate the incidence at 1-7 annually per 10 million people below the age of 16 [5].

The therapy consists of treatment of both clinical symptoms and the encephalitis itself. Therapeutic objectives are set individually for every patient depending on the requirements of their clinical situation [1, 7, 11]. In the event of drug-resistant epilepsy, which often occurs in the Rasmussen syndrome and was the case in our patient, a surgical procedure of functional hemispherectomy is considered. It often allows to reduce radically or even control completely epileptic seizures and gain functional improvement [2, 3, 4, 12, 13]. However, this type of therapy is not possible if changes have been detected in both hemispheres [3, 15]. The procedure is not recommended once the intensity of seizures has decreased. In our case the frequency of seizures declined, yet the child's mother seeks to have the neurosurgery performed, which may be impeded by two concurrent diseases causing encephalitis. Moreover, from the ethical perspective, strongly and decidedly emphasized in the European consensus statement [7], no new therapeutic options in treating patients with the Rasmussen syndrome have been documented for the last decade.

The patients with RS require specialist and multidisciplinary rehabilitation covering motor re-education, functional training of general rehabilitation, learning of self-care, support of speech and cognitive functions. However, high spasticity, muscle contractures, disturbed proprioception, the sense of balance and the sense of own body, as well as depression and apathy render rehabilitation difficult [13, 14]. The above disorders have been observed in our patient, nonetheless the mother makes every effort to seek a wide-range rehabilitation. It should be underlined, though, that RS is not the only confirmed diagnosis in this case. Lyme disease provides additional background which may modify the clinical picture. The literature indicates that increased antibody titres are not always confirmed but the symptoms concern also the nervous system [15, 16], which makes the clinical picture of our patient's disease more difficult to interpret.

Open bite is related to the presence of a smaller or larger gap due to lack of contact between the teeth of the upper and lower dental arch. It may occur in the anterior section or lateral section unilaterally or bilaterally. Such anomalies disturb the function of biting off, mastication, speech and swallowing. In our case, the patient was diagnosed with a complete open bite at the age of 13. The contact between the teeth was observed as far as at the 2nd molars on the right and 1st molars on the left.

Etiology of the open bite may be a combination of genetic and environmental factors. Entrenched incorrect habits such as sucking of a thumb or a pacifier (parafunctions), nasal congestion and related mouth breathing, i.e. functional disorders (dysfunctions) have a significant effect on development of that dento-alveolar disorder. Genetic factors, which determine a specific growth pattern, also play a role in the development of a skeletal open bite [17]. In the presented case, secondary occlusal disorders occurred resulting in an open bite, which has been developing dynamically along with bilateral cross bite and bone changes in the stomatognathic system, including changes in the temporomandibular joints.

Treatment of an open bite depends on the location and etiology of the anomalies. Open bite related to the alveolar process and teeth absolutely require functional control, especially as regards the function of the orbicularis oris muscle and the tongue, i.e. it is necessary to eliminate the dysfunctions and parafunctions being the direct cause of the dental anomalies. Skeletal open bite in young patients still in the growth period requires the direction of the growth to be steered, whereas in adult patients, whose growth stage has ended, it is possible to obtain the contact between the opposite teeth by means of a therapy with teeth extraction or orthognathic procedure after a prior orthodontic alignment of teeth. The most popular methods of early therapy of skeletal disorders include: the use of high headgear anchored in the upper dental arch (face bow) or the lower dental arch (chin cap); the use of bite surfaces in functional appliances and tongue blocks as a separate appliance or an element of other fixed and removable appliances; the use of magnets in removable appliances; muscle and speech exercises [18]. Patients with vertical defects, which include open bite, often require a multi-disciplinary, orthodontic and orthognathic therapy. Nevertheless, the fear of an extensive procedure in the area of the craniofacial skeleton often presents a barrier which patients are unable to overcome. In such cases an accurate selection of biomechanics during the orthodontic therapy is of importance. Intrusion of the incisors can be achieved with the use of orthodontic miniscrews. The use of that treatment based on ortho-implants and bone anchorage may present an alternative to the multi-disciplinary, orthodontic and surgical therapy [19, 20]. However, in the case of our patient none of the above therapy proposals can be used because of a continuing dynamic changes in the craniofacial area. Due to ethical reasons, if the patient is a minor, it is necessary to obtain the consent of both parents for the proposed treatment, having informed them in detail about the benefits and possible difficulties and complications. The child's therapy cannot be commenced without that consent [21]. Unfortunately, the parents of our patient have not agreed a common stance, which may result in court proceedings as in such situations the court is the only instance which may take a final decision on that difficult issue. The difficulty in this case concerns the general direction of further therapeutic proceedings,

as orthodontic treatment is only a small part of the planned therapy. In such a situation, the most important thing is to consider if the therapy is justified in terms of improving the quality of the child's life and sparing pain in debatable cases with questionable and uncertain effect of the treatment.

CONCLUSIONS

Planning the orthodontic therapy in the patient with the Rasmussen syndrome is closely related to the clinical picture – incidence of an open bite, and is limited by a progressive nature of the neurological dysfunction. The anomalous tone of the facial muscles cannot be eliminated, however we may treat the symptoms, i.e. eliminate the negative effect of a dysfunctional tongue, which was applied in the presented case.

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