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Letter to the Editor

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Current Aspects of Treatment Options of Chronic Sialorrhea in Children

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To the Editor

Sialorrhea in children is not a primary disease, but the sequela of an existing underlying disease [1-48]. Excessive salivation frequently occurs in children suffering from cerebral palsy (rates between 10% and 58%) [1, 4, 5, 7, 11, 14, 18, 22, 33-35, 39, 40, 42, 43]. This is caused by early brain damage before or at birth or in infancy, which becomes apparent in the first years of life in physical limitations and reduced intelligence [2, 3, 6, 8-10]. Depending on the severity of the disease, the affected children suffer from movement disorders, swallowing difficulties and lack of control over certain muscle groups in the mouth area, among other things [1-49]. Other neurological disorders, such as severe craniocerebral injuries, as well as several developmental disorders can also lead to chronic sialorrhea [1, 4, 5, 7, 11, 14, 18, 22, 33-35, 39, 40, 42, 43]. Hypersalivation refers to a relatively or absolutely excessive flow of saliva, which can lead to wetting of the lips, chin, hands, the surrounding area and to the entry of saliva into the deep airways to varying degrees due to insufficient orofacial abilities and/or a disturbance of sensorimotor control of the swallowing process. This complaint often occurs as an accompanying symptom in patients with a variety of neurological diseases, which may be acute, such as stroke, traumatic brain injury, meningoencephalitis, Guillain-Barre syndrome, critical illness polyneuropathy, and tumors [3, 4, 14]. Nevertheless, autoimmune diseases like multiple sclerosis, myositis and myasthenia, neurodegenerative diseases like amyotrophic lateral sclerosis, Parkinson syndromes as well as muscle diseases lead to hypersalivation [3, 4, 14]. In children, cerebral palsy and several congenital syndromes are associated with sometimes significantly increased salivation [1, 4, 5, 7, 11, 14, 18, 22, 33-35, 39, 40, 42, 43]. The wide range of genesis and the multifactorial aspects of the underlying diseases have led to many studies on the treatment of hypersalivation in recent years, but with little robust evidence.

Saliva contains mucin, opiorphin, IgA and haptocorrin and to a highest content of water [6, 7, 9, 12, 34, 35]. Saliva production will be controlled by parasympathetic and sympathetic nerve system. Excessive drooling is pathological at age 4 in childhood [23, 32, 41]. The prevalence ranges around 0.6% and is most often found in despaired children with cerebral palsy or other neurodevelopmental disorders. Saliva production in children is measured in children in a rate up to 1.5 L/day, whereas 3.5 mL/min is defined as hypersalivation, accordingly 5 L/day. Saliva is produced in general in six salivary glands, in two parotid glands, in two submandibular glands and two sublingual glands (both sides included) [1, 3, 5, 6, 9, 14]. In unactivated state, saliva will be produced in submandibular and sublingual glands, whereas in activated state, the parotid glands on both sides play a more important role in producing saliva [1, 8, 9, 26, 41]. Salivary production is normal in newborn, finishes around the 15-18th months of age and is pathological at age 4 [1, 3, 5, 6, 9, 14]. Different subjective scales show different extents of chronic drooling [23, 31, 34, 44]. Risks of chronic drooling in childhood are macerated facial skin, respiratory involvement with aspiration and pneumonia and water imbalance with dehydratation in the child in excessive forms of hypersalivation. Etiological aspects include also anatomical problems, sensory dysfunction, neuromuscular anomalies and hypersecretion. Most important is the impact of sialorrhea on patient's quality of life [21, 22, 34, 44, 47, 48]. The main focus is on the clarification of swallowing disorders with saliva aspiration and of orofacial motor deficits. Diagnostic procedures include clinical screening examinations as well as: 1) specific ear, nose, and throat (ENT) medical, if necessary, phoniatric examinations of the oral pharynx, the larynx, the swallowing and speech functions, and the internal nose; or 2) in case of neurogenic dysphagia, neurological examinations including fiberoptic endoscopic evaluation of swallowing (FEES). Radiological procedures such as videofluoroscopy can provide important complementary information on the genesis, therapy selection and control. In cases of neurological, traumatic or tumor-therapeutic defect disorders, swallowing-therapeutic exercise measures are indispensable for activating and learning compensatory mechanisms.

Therapy is based on a team approach with speech therapists, dentists, otolaryngologists, neurologists, acupuncture and surgery by ENT specialist [1-48]. Algorithm focuses on four different therapy options: non-pharmacological, pharmacological, surgical and radiotherapeutic treatment options [1-48]. Non-pharmacological therapy options are speech-, physio- and orofacial therapy. Pharmacological options to treat

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sialorrhea are botulinum A/B intra-glandular injections (level A evidence) and anticholinergic treatment like glycopyrronium bromide or transdermal patch therapy with scopolamine (level B evidence) [9, 13, 15, 18-20, 28, 29, 31, 32, 34, 35, 38, 39, 43, 44, 47]. Useful drug therapies for acute hypersalivation include various application forms of glycopyrrolate, of which glycopyrronium bromide received a pan-European pediatric use authorization (PUMA) in 2017 for the symptomatic treatment of hypersalivation in children and adolescents [5]. In recent years, botulinum toxin injections into the major salivary glands have been shown to be an effective and safe treatment modality with long-lasting saliva reduction [9, 13, 15, 18-20, 28, 29, 31, 32, 34, 35, 38, 39, 43, 44, 47]. All anticholinergic medications induce typical side effects like dry mouth, constipation, urinary retention and reduced bronchial secretion. Surgical treatment is based on excision of salivary glands or ligation of salivary ducts. There are many different surgical procedures to curatively treat chronic drooling.

The best procedure with highest relief based on a big meta-analysis is bilateral parotid duct ligation and submandibular gland excision. Despite this procedure, four-duct surgical ligation procedure has the lowest success in curative treatment of this rare entity in children [48]. In individual cases, surgical interventions may also be useful by myotomy of the upper esophageal sphincter. Especially in children with hypotonic orofacial muscles, myofunctional therapy concepts are indicated. In addition, oral voice plates as an orthodontic intervention can lead to symptom reduction in the multimodal therapy concept by changing tongue activity and positioning as well as improved lip closure. In conclusion, chronic sialorrhea in children remains a challenge in conservative and surgical treatment, whereas clear guidelines exist but should be temporarily adjusted and optimized due to present knowledge of this serious entity.

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Not applicable.

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SB wrote the article, LB made suggestions and corrections of the references, GV checked the information details and references, EL worked on manuscript, and EMA checked the references in detail.

Data Availability

The authors declare that data supporting the findings of this study are available within the article.

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