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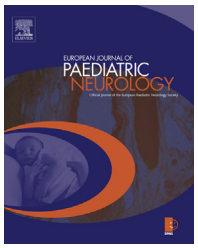

Review article

Evaluation of the efficacy of cervical perivascular sympathectomy on drooling in children with athetoid cerebral palsy

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ABSTRACT

Objective: To evaluate the efficacy of cervical perivascular sympathectomy (CPVS) for drooling in children with athetoid cerebral palsy (ACP).

Methods: The severity and frequency of drooling and the amount of salivation of 32 ACP children with drooling were evaluated before CPVS and at 4th, 12th and 24 weeks post-operatively by the teacher drooling scale (TDS) and salivary flow rate (SFR).

Results: Fifteen children exhibited improvements on drooling according to the TDS score at 4th week after surgery ($P < 0.05$). Later, the number of children decreased to 10 at 12th week ($P < 0.05$) and to 8 at 24 week after surgery ($P < 0.05$). SFR was 0.67 mg/min at baseline, which decreased to 0.58 mg/min ($P < 0.05$) at 4th week after surgery. However, SFR showed a gradual increase at 12th week and 24 week with no significant difference.

Conclusions: Although CPVS was effective in improving drooling in some children with ACP, the results were not satisfactory. Thus, CPVS still needs to be cautiously used. Furthermore, more rigorous clinical studies should be performed to detect the effectiveness and safety of this procedure.

Contents

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1. Introduction

Cerebral palsy (CP) is the commonest neurodisabling disease in childhood with 22%–40% incidence of excessive drooling co-morbidity.[1,2] Compared with typically developing children, the patients with drooling do not produce excessive saliva.[3] The main factors on drooling may include the serious motor or intellectual impairment, poor head control, active seizure, no useful speech, poor lip closure and dysphagia.[1,3–5] "Excessive drooling" may increase the burden of care for parents and carers[6] or result in low self-esteem and social isolation in some children.[7]

There is no definite consensus regarding the interventions that are safe and effective in managing drooling in children with CP. Physical and behavioral therapies can be combined with other treatments, oral medications, botulinum injections and salivary glands surgeries are designed to reduce the amount of saliva secretion. In some studies, these interventions have been reported to exhibit recurrence in some individuals in the long term.[8,9] Constipation, urinary retention, vomiting, diarrhea are common complications of oral medications.[10] It is noteworthy that BTI do not improve the swallowing function and may even make it worse.[11,12] Some surgeries in salivary glands showed effective and stable results in long term follow up,[13] however, a large proportion of patients experienced different complications, regrettably, a small part of which were serious and irreversible, such as hemorrhage, swelling, aspiration pneumonia.[13,14] In 1970s, neurectomy was introduced in treating excessive drooling. Parasympathetic denervation or tympanic nerve sectioning is initially effective in treating drooling, but the results were disappointing in the long term,[15] moreover, serious complications were reported, such as hearing and taste loss.[16]

Dyskinesia is a major subtype of CP with involuntary movements. If there is increased activity with reduced tone, the children with dyskinetic CP were classified as choreoathetoid or athetoid.[17] In a previous study conducted in China, cervical perivascular sympathectomy (CPVS), another neurectomical intervention, was employed to treat children with athetoid cerebral palsy (ACP). After a 1-year follow-up, the parents or caregivers of 40% of the patients were satisfied with the improvement in drooling, furthermore, CPVS was also effective in improving many other symptoms in these children, such as the movements of head and neck, upper limb coordination and speech.[18]

However, there are few reports on the effect of CPVS in treating children with ACP. Whether CPVS could be a significant drooling choice for the children, it has not been proven by clinical study. The operation was introduced in Sichuan Rehabilitation Hospital, China, in March 2012. In this retrospective cohort study, teacher drooling scale (TDS) and salivary flow rate (SFR) were used to evaluate the frequency and degree of drooling and the amount of salivation in children with ACP before and after the intervention in 24 weeks.

2. Subjects and method

2.1. *Collected subjects*

From March 2012 to December 2013, there were 105 children with ACP who received CPVS in Sichuan Rehabilitation Hospital, China. To retrospectively evaluate the effect of CPVS on drooling, the inclusive criteria of CPVS were as follows: (1) moderate to severe drooling (TDS score $\geq$3); (2) parents' or caregivers' total understanding of the potential benefits and risks of the CPVS; (3) had no improvement in the past 6 months with rehabilitation for drooling. The exclusive criteria of the study were as follows: (1) subjects had not received any treatments such as botulinum toxin injection or anticholinergic medications in 6 months before or after CPVS. (2) previous maxillofacial surgery that might interfere in salivary production or flow. (3) moderate or serious intellectual impairment. At last, 32 patients met the inclusive criteria. The clinical data of these 32 children were collected and analyzed in our study. The age of the subjects ranged from 4 to 16 years and their data are listed in Table 1.

2.2. *Drooling evaluation*

The frequency and degree of drooling were evaluated according to the Teacher Drooling Scale (TDS), consisting of a 5-point scale for severity and frequency (Table 2). A score 5 indicates constantly wet and saliva leaking on clothes and furniture, score 3 means occasionally drooling, and score 1 indicates no drooling.[19] 1-point decrease was considered improvement in TDS. The scores was evaluated by speech therapist, parents or caregivers together according to average performance of the all daytime.

The process of salivary flow rate (SFR) measurement was as follows. The children were assessed in the morning with an