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Review Article

Use of Botulinum Toxin and Phenol to Treat Muscle Tone Disorders in pediatric patients seen at a rehabilitation center

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ABSTRACT

Objective: To understand the epidemiological profile of the outpatient clinic for neurolytic block at a rehabilitation center, and to compare the outcomes of use of phenol and botulinum toxin, based on achieved goals and clinical parameters.

Methods: A longitudinal, analytical, census-based study, with data collected from the pediatric chemical block outpatient clinic, between January 2022 and December 2023. The epidemiological data, number of previous blocks, initial and achieved goals, scores, type of block, side effects, results measured by the Ashworth scale, and range of motion by goniometry were extracted from the electronic medical records on the day of the injection and at the four-week reassessment visit.

Results: A total of 253 procedures were performed. The most frequent clinical and topographic diagnoses were cerebral palsy (95.7%) and spastic diplegia (54.5%), respectively. The main goal proposed was positioning (78.7%). The goals were achieved in 63% of blocks. The side effect more often reported was pain on injection site (11.1%). There was no statistically significant difference in gain of range of motion, measured in degrees; improvement in spasticity, assessed by the Ashworth scale; and achieved goals, among the muscle groups treated with phenol or botulinum toxin for elbow extension, hip abduction, and knee extension.

Conclusion: There was no difference in the parameters assessed for use of botulinum toxin or phenol. We found low percentage and severity of adverse effects after neurolytic blocks performed by specialized professionals at a reference rehabilitation center.

Keywords: Muscle spasticity; Cerebral palsy; Neuromuscular block; Rehabilitation; Central nervous system diseases

INTRODUCTION

Central Nervous System (CNS) diseases are increasingly more frequent and result in many sequelae and disabilities for patients [1]. Among the most common CNS conditions in children, cerebral palsy is still the most frequent, followed by childhood acquired brain injuries (secondary to Traumatic Brain Injury (TBI), stroke, CNS infections) [2].

The common consequence of these diseases is the onset of movement disorders, such as spasticity and dystonia. Lesions may occur in the pyramidal or extrapyramidal systems, the former being more common. The injuries in the extrapyramidal system present as involuntary movements, such as dystonia, athetosis and chorea, among others. The pyramidal system lesions may present as muscle weakness, axial hypotonia, loss of movement selectivity, increased myotendinous reflexes, muscle clonus, and spasticity [3].

Spasticity, also known as spastic hypertonia, is a motor control disorder resulting from a lesion in the upper motor neuron that presents as involuntary and exaggerated muscle activation. It is clinically characterized by increased velocity-dependent muscle tone and is accompanied by other signs of upper motor neuron syndrome, such as clonus, spasms, or simultaneous contractions of antagonist muscle groups [3].

Spasticity is extremely prevalent and can also be very limiting.

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It can cause pain, postural changes, and movement limitations; progress progress to joint deformities over time; interfere with daily activities like dressing, hygiene, and walking, thus restricting the individual's participation in tasks. In some cases, it may assist with certain tasks, such as maintaining an upright posture, when the patient has severe muscle weakness; however, in general, it is a limiting factor [3,4].

There are several treatments, ranging from the most conservative, like physical therapy and the use of orthoses, to orthopedic or neurological surgeries [3]. Neurolytic block is one management modality for spasticity and dystonia.

The objective of this study is to understand the epidemiological profile of a neurolytic block outpatient clinic at a reference rehabilitation center, checking the diseases treated, number of blocks performed, doses, indicated sites, side effects, among others, and to compare the outcomes of using phenol and botulinum toxin, based on achieved goals and clinical parameters.

METHODS

This is a longitudinal, retrospective, analytical, census-based study in which an active search of appointments was conducted at the pediatric Chemical Block (CB) outpatient clinic. The patients were seen through the modality National Health System (SUS, acronym in Portuguese) and referred by physiatrists at a rehabilitation reference center in the city of Sao Paulo, Brazil, between January 2022 and December 2023. The exclusion criterion was incomplete medical records.

Data were gathered from electronic medical records on the day of the injection and on the day of reassessment, which occurs, on average, four weeks later. The following data were collected: Epidemiological data; The number of previous blocks; The muscle or nerve sites treated; Doses; Simple or mixed blocks (phenol combined with botulinum toxin type A-TBA); Side effects; Initial goals (function, wheelchair positioning and standing up, orthotic management, hygiene, dressing, and pain relief) and achieved goals (defined based on the patient's and family's perception, together with the rehabilitation team); Outcomes (modified Ashworth scale and range of motion, measured in degrees using a goniometer); Use of orthoses; Previous orthopedic surgery; and history of current rehabilitation therapies.

To compare the use of BTA and phenol, we chose elbow extension (injection in the biceps brachii muscle versus musculocutaneous nerve); hip abduction (injection in the adductor muscles of the thigh versus the anterior branch of obturator) and popliteal angle; and knee extension (injection in the hamstring versus motor branch of cyatic nerve) to check for differences in Ashworth scale, range of motion (by goniometry) and achieved goals, before and after block.

Data were described using frequency and confidence intervals for qualitative variables, and measures of central tendency (mean and median) and measures of dispersion (standard deviation, interquartile range, minimum, and maximum) for quantitative variables. Association between qualitative variables was checked by the chi-squared test, and comparisons between qualitative and quantitative variables were conducted using the Mann-Whitney test. All analyses were performed using R software[1] and results with a p-value less than 5% were considered statistically significant. The modified Ashworth scale is subdivided into 0, 1, 1+, 2, 3, and 4, with 1+ replaced by 1.5 for statistical purposes.

The study was submitted to and approved by the Ethics and Research Committee on August 27, 2024, CAAE 80463224.3.0000.0085, opinion number 7.034.621.

RESULTS

A total of 253 chemical blocks with BTA and/or phenol in 226 patients were analyzed during the study period. Age ranged from 1 to 18 years, mean age of 7.1 years (SD: 4.0, with predominance of males (151, 59.7%). The most frequent clinical diagnosis was cerebral palsy (242, 95.7%), with predominance of the diparetic topographic classification (138, 54.5%), and the most common movement disorder was spasticity (98%). Among the patients with cerebral palsy (n=242), GMFCS level IV (79, 32.8%) was more frequent, followed by levels V (26.6%) and III (18.3%). Sixty-six percent of patients were on therapy, approximately 90% were using orthoses, and 80% had not been submitted to orthopedic surgery (Table 1).

Table 1: Qualitative and quantitative sociodemographic variables of pediatric patients, including number (n), frequency (%), and 95% Confidence Interval (95% CI).

Variable	Categories	n	% (95% CI)
Sex	Male	151	59.7 (53.8-66.1)
	Female	102	40.3 (34.4-46.7)
Clinical diagnosis	Cerebral palsy	242	95.7 (93.7-98.0)
	Stroke	7	2.8 (0.8-5.1)
	Anoxia after CPA	2	0.8 (0.0-3.2)
	Spinal cord injury	1	0.4 (0.0-2.8)
	TBI	1	0.4 (0.0-2.8)

Topographic diagnosis	Diparesis	138	54.5 (48.6-61.1)
	Tetraparesis	62	24.5 (18.6-31.0)
	Hemiparesis	35	13.8 (7.9-20.4)
	Dyskinetic cerebral palsy	12	4.7 (0.0-11.3)
	Bilateral hemiparesis	4	1.6 (0.0-8.1)
	Paraplegia/Paraparesis	2	0.8 (0.0-7.3)
Spasticity	No	5	2.0 (0.8-3.7)
	Yes	248	98.0 (96.8-99.7)
Dyskinesia	No	209	82.6 (78.3-87.3)
	Yes	44	17.4 (13.0-22.1)
GMFCS	Level 1	18	7.5 (1.2-14.3)
	Level 2	36	14.9 (8.7-21.8)
	Level 3	44	18.3 (12.0-25.1)
	Level 4	79	32.8 (26.6-39.6)
Therapies	No	85	33.7 (28.2-40.0)
	Yes	167	66.3 (60.7-72.5)
Orthoses	No	26	10.3 (7.1-14.2)
	Yes	226	89.7 (86.5-93.5)
Previous orthopedic surgeries	No	202	80.2 (75.4-85.0)
	Yes	50	19.8 (15.1-24.7)

Note: CPA: Cardiopulmonary Arrest; TBI: Traumatic Brain Injury; GMFCS: Gross Motor Function Classification System in cerebral palsy.

Ninety-nine (51.3%) patients were undergoing their first injection and 27 (10.7%), the second injection at the outpatient clinic. Of the treatments performed, BTA was used alone in 45.5% of cases, phenol alone in 21.7%, and combined (BTA + phenol) in 32.8%.

In those receiving BTA (200 procedures, 79%, all with 500 units of abobotulinum toxin A), the mean injection volume was 21.4 units per kilogram (SD: 10.1 U). The procedures were performed at the operating room 57.7% of patients, using the localization method with electrical stimulation in 57.3% of cases (Table 2).

Table 2: Characteristics of block procedures in pediatric patients, including number (n), frequency (%), and 95% Confidence Interval (95% CI).

Variable	Categories	n	% (95% CI)
Previous chemical blocks	0	99	46.5 (39.9-53.9)
	1	64	30.0 (23.5-37.5)
	2	34	16.0 (9.4-23.4)
	3	11	5.2 (0.0-12.6)
	4	4	1.9 (0.0-9.3)
	5	1	0.5 (0.0-7.9)
Localization method	Electrical stimulation	145	57.3 (51.4-63.9)
	Anatomical	108	42.7 (36.8-49.2)

Sedation in OR	No	107	42.3 (36.4-48.8)
	Yes	146	57.7 (51.8-64.2)
Type of block	BTA	115	45.5 (39.1-52.3)
	Combined	83	32.8 (26.5-39.7)
	Phenol	55	21.7 (15.4-28.6)

Note: OR: Operating Room; BTA: Botulinum Toxin Type A

The main therapeutic objectives were improvement in positioning (199, 78.7%), enabling orthotic management (158, 62.5%), optimized function of the treated limb (105, 41.5%) and assisting in hygiene (80, 31.6%). After the intervention, the goals were fully achieved in 172 cases (69.6%) and partially achieved in 57 (23.1%) Adverse effects were reported by 37 (14.8%) patients, and pain was the most frequent complaint (28, 11.2%). No patient reported more than one adverse effect (Table 3).

Table 3: Reported objectives for neuromuscular block in pediatric patients, achieved goals and adverse reactions, including number (n), frequency (%), and 95% Confidence Interval (95% CI) for participants aged under 18 years.

Objectives	Categories	n	% (95% CI)
Positioning	No	54	21.3 (16.6-26.5)
	Yes	199	78.7 (73.9-83.8)
Orthotic management	No	95	37.5 (31.6-43.8)
	Yes	158	62.5 (56.5-68.7)
Function	No	148	58.5 (52.6-65.0)
	Yes	105	41.5 (35.6-48.0)
Hygiene	No	173	68.4 (62.8-74.4)
	Yes	80	31.6 (26.1-37.6)
Dressing	No	182	71.9 (66.8-77.8)
	Yes	71	28.1 (22.9-34.0)
Pain relief	No	246	97.2 (95.7-99.2)
	Yes	7	2.8 (1.2-4.7)
Achieved goals	No	18	7.3 (2.0-13.3)
	Partially	57	23.1 (17.8-29.1)
	Yes	172	69.6 (64.4-75.7)
Adverse reaction			
Pain	No	221	88.8 (85.1-92.5)
	Yes	28	11.2 (7.6-15.0)

Weakness	No	243	97.6 (96.0-99.2)
	Yes	6	2.4 (0.8-4.0)
Malaise	No	246	98.8 (98.0-100.0)
	Yes	3	1.2 (0.4-2.6)

The gastrocnemius was the muscle more often treated with BTA (247, 48.8%), whereas the anterior branch of obturator nerve (ABON) was the most frequently blocked nerve with phenol (260 injections; 51.4%), followed by the motor branch of cyatic nerve (154, 30.4%) All blocks performed with phenol were at 5%, with maximum volume of 2 mL per site and total of 10 mL (Table 4).

Table 4: Injection site for botulinum toxin and phenol, including number (n), frequency (%), and 95% Confidence Interval (95% CI), broken down by side of injection and total number of muscles/nerves evaluated in pediatric patients.

BTA - Muscle	Categories	Right		Left		Total (%)
		n	% (95% CI)	n	% (95% CI)	
Gastrocnemius	No	126	49.8 (43.9-56.5)	133	52.6 (46.6-59.3)	259 (51.2)
	Yes	127	50.2 (44.3-56.9)	120	47.4 (41.5-54.1)	247 (48.8)
Biceps brachii	No	231	91.3 (88.1-94.6)	233	92.1 (89.3-95.5)	464 (91.7)
	Yes	22	8.7 (5.5-12.0)	20	7.9 (5.1-11.3)	42 (8.3)
Flexor carpi ulnaris	No	238	94.1 (91.7-97.0)	239	94.8 (92.5-97.4)	477 (94.5)
	Yes	15	5.9 (3.6-8.8)	13	5.2 (2.8-7.7)	28 (5.5)
Adductor magnus	No	239	94.5 (92.1-97.2)	239	94.5 (92.1-97.2)	478 (94.5)
	Yes	14	5.5 (3.2-8.3)	14	5.5 (3.2-8.3)	28 (5.5)
Tibialis posterior	No	239	94.5 (92.1-97.2)	241	95.3 (93.3-98.0)	480 (94.9)
	Yes	14	5.5 (3.2-8.3)	12	4.7 (2.8-7.4)	26 (5.1)
Hamstring	No	244	96.4 (94.5-98.5)	242	95.7 (93.7-98.2)	486 (96)
	Yes	9	3.6 (1.6-5.6)	11	4.3 (2.4-6.9)	20 (4)
Adductor pollicis	No	242	95.7 (93.7-98.2)	245	96.8 (95.3-99.0)	487 (96.2)
	Yes	11	4.3 (2.4-6.9)	8	3.2 (1.6-5.4)	19 (3.8)
Flexor digitorum superficialis	No	249	98.4 (97.2-99.8)	247	97.6 (96.0-99.2)	496 (98)
	Yes	4	1.6 (0.4-2.9)	6	2.4 (0.8-4.0)	10 (2)
Phenol - Nerve	Categories		Right	Left		Total
		n	% (95% CI)	N	% (95% CI)	

Anterior branch of obturator	No	123	48.6 (42.7-55.3)	123	48.6 (42.7-55.3)	246 (48.6%)
	Yes	130	51.4 (45.5-58.1)	130	51.4 (45.5-58.1)	260 (51.4%)
Motor branch of cyatic	No	176	69.6 (64.0-75.4)	176	69.6 (64.0-75.4)	352 (69.6%)
	Yes	77	30.4 (24.9-36.3)	77	30.4 (24.9-36.3)	154 (30.4%)
Musculocutaneous	No	231	91.3 (88.1-94.6)	230	90.9 (87.7-94.3)	461 (91.1%)
	Yes	22	8.7 (5.5-12.0)	23	9.1 (5.9-12.5)	45 (8.9%)
Variable		N	Absent	Mean (±SD)	Median (IQR)	Min-Max
Total BTA dose		198	55	437.5 (±192.1)	500.0 (300.0-500.0)	50.0-1700.0
Total phenol dose		138	115	6.3 (±2.3)	8.0 (4.0-8.0)	1.0-10.0

Note: BTA: Botulinum Toxin Type A

As to spasticity grading according to the modified Ashworth scale, the most frequent classification before block was 1+ for upper and lower limbs. After block, the classification most often observed was 1 for or upper and lower limbs (Table 5).

Table 5: Classification according to the Ashworth scale for spasticity of each limb of pediatric patients, before and after the block, including number (n), frequency (%), and 95% confidence interval (95% CI).

Localiation	Categories	Before		After	
		n	% (95% CI)	n	% (95% CI)
Right upper limb	0	8	11.4 (0.0-24.3)	8	13.3 (1.7-25.3)
	1	19	27.1 (15.7-40.0)	36	60.0 (48.3-72.0)
	1,5	23	32.9 (21.4-45.7)	11	18.3 (6.7-30.3)
	2	19	27.1 (15.7-40.0)	4	6.7 (0.0-18.7)
	3	1	1.4 (0.0-14.3)	1	1.7 (0.0-13.7)
Total		70	100%	60	100%
Left upper limb	0	6	8.6 (0.0-21.5)	6	10.3 (0.0-23.8)
	1	17	24.3 (12.9-37.2)	31	53.4 (41.4-66.9)
	1,5	28	40.0 (28.6-52.9)	17	29.3 (17.2-42.8)
	2	19	27.1 (15.7-40.0)	3	5.2 (0.0-18.7)
	3	0	-	1	1.7 (0.0-15.2)
Total		70	100%	58	100%
Right lower limb	0	4	2.0 (0.0-9.0)	9	5.1 (0.0-13.2)
	1	27	13.5 (6.5-20.5)	81	46.0 (38.6-54.1)
	1.5	112	56.0 (49.0-63.0)	74	42.0 (34.7-50.1)
	2	56	28.0 (21.0-35.0)	12	6.8 (0.0-14.9)
	3	1	0.5 (0.0-7.5)	0	-

Total		200	100%	176	100%
Left lower limb	0	2	1.0 (0.0-8.6)	5	2.9 (0.0-10.9)
	1	22	11.4 (4.7-18.9)	78	44.8 (37.4-52.9)
	1.5	109	56.5 (49.7-64.0)	77	44.3 (36.8-52.3)
	2	59	30.6 (23.8-38.1)	14	8.0 (0.6-16.1)
	3	1	0.5 (0.0-8.1)	0	-
Total		193	100%	174	100%

In difference of range of motion, measured by goniometer, between post-block and pre-block, the following gains were observed:

- For abrupt abduction of hip with extended knees: 8.7º (±10.9);
- For abrupt abduction of hip with flexed knees: 8.5º (±11.6);
- For right and left popliteal angle: 10.4° (±16.4) and 10.7° (±15.8), respectively;
- For right and left elbow: 4.4° (±9.5) and 4.1° (±10.4), respectively;
- For right and left ankle dorsiflexion with extended knees: 2.0° (±4.6) and 2.2° (±4.5);
- For right and left ankle dorsiflexion with flexed knees: 2.6° (±5.7) and 2.9° (±5.3);
- For right and left knee: 6.1° (±12.1) and 5.2° (±13.2), respectively;
- For right and left wrist: 1.2° (±3.8) and 1.6° (±5.7), respectively;

There was no difference in Ashworth scale in upper limbs between BTA in BB (biceps brachii) and phenol in musculocutaneous (p-value 0.878), and in lower limbs between BTA and hip adductors and phenol in the anterior branch of obturator (p-value 0.833), and in lower limbs between BTA in hamstring and phenol in the motor branch of cyatic (p-value 0.833). Comparing the achieved goals between injections with BTA alone, phenol alone and combined block (BTA + phenol), there were no differences (p-value 0.314) (Table 6).

Table 6: Distribution of frequency for modification in Ashworth scale in upper and lower limbs, and achieving goals with use of phenol or BTA, and comparison of performance using the chi-squared test, in the pediatric population.

Variable	Biceps brachii		Musculocutaneous		P-value
	n	% (95% CI)	n	% (95% CI)	
Upper limb					
-1.5	1	2.6 (0.0-19.3)	0	0.0 (0.0-18.6)	0.878
-1	5	13.2 (0.0-29.8)	7	20.6 (5.9-39.2)	
-0.5	22	57.9 (44.7-74.5)	16	47.1 (32.4-65.6)	
0	7	18.4 (5.3-35.1)	7	20.6 (5.9-39.2)	
0.5	1	2.6 (0.0-19.3)	4	11.8 (0.0-30.4)	
1	2	5.3 (0.0-21.9)	0	0.0 (0.0-18.6)	
Variable	**Adductors**		**ABON**		**P-value**
	n	**% (95% CI)**	**n**	**% (95% CI)**	
Lower limb					
-2	0	0.0 (0.0–28.0)	1	0.8 (0.0-10.1)	0.833
-1	2	11.8 (0.0-39.7)	13	10.7 (1.6-19.9)	
-0.5	8	47.1 (29.4-75.0)	46	37.7 (28.7-47.0)	
0	5	29.4 (11.8-57.4)	61	50.0 (41.0-59.3)	

0.5	2	11.8 (0.0-39.7)	1	0.8 (0.0-10.1)	

Variable	Hamstring		Motor branch of cyatic		P-value
	n	% (95% CI)	n	% (95% CI)	
Lower limb					
-2	0	0.0 (0.0-28.0)	1	0.8 (0.0-10.1)	0.833
-1	2	11.8 (0.0-39.7)	13	10.7 (1.6-19.9)	
-0.5	8	47.1 (29.4-75.0)	46	37.7 (28.7-47.0)	
0	5	29.4 (11.8-57.4)	61	50.0 (41.0-59.3)	
0.5	2	11.8 (0.0-39.7)	1	0.8 (0.0-10.1)	

Variable	BTA		Phenol		Combined		P-value
	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	
Achieved goals							
No	11	9.7 (1.8-19.2)	1	1.9 (0.0-12.9)	6	7.3 (0.0-17.7)	0.314
Partially	29	25.7 (17.7-35.1)	10	19.2 (9.6-30.2)	18	22.0 (13.4-32.3)	
Yes	73	64.6 (56.6-74.0)	41	78.8 (69.2-89.8)	58	70.7 (62.2-81.1)	

In range of motion of elbow extension, comparing BTA and BB, and phenol and musculocutaneous, there was no difference (p-value 0.973). In range of motion of hip abduction, comparing BTA in adductors with phenol in ABON, there was no difference in gain of range before and after the procedure (p-value 0.649). In range of motion considering the popliteal angle, comparing BTA in hamstring, and phenol in motor branch of cyatic, there was no difference (p-value 0.717). In range of motion of knee extension, comparing BTA in hamstring, and phenol in motor branch of cyatic, there was no difference (p-value 0.708) (Table 7).

Table 7: Descriptive statistics of gain in range of motion for use of phenol and BTA, comparing performance by mans of the Mann-Whitney, in the pediatric population.

	ROM	N	Absent	Mean (±SD)	Median (IQR)	Min-Max	P-value
BTA BB	Elbow extension	40	2	-4.0 (±8.0)	0.0 (-10.0-0.0)	-30	0.973
Phenol - MC		30	15	-5.5 (±12.8)	0.0 (-8.8-0.0)	-50	
BTA Adductors	Hip abduction	18	10	10.0 (±9.7)	10.0 (0.0-10.0)	0.0-30.0	0.649
Phenol - ABON		220	40	8.6 (±11.5)	10.0 (0.0-20.0)	-50	
BTA Hamstring	Popliteal angle	6	14	-13.3 (±10.3)	-20.0 (-20.0-5.0)	-20	0.717
Phenol - MB of cyatic		130	24	-12.7 (±16.6)	-10,0 (-20,0-0,0)	-85	
BTA Hamstring	Knee extension	8	12	-7.5 (±12.2)	-7.5 (-16.2-1.2)	-35	0.708
Phenol - MB of cyatic		50	104	-4.9 (±12.3)	-2.5 (-16.2-1.2)	-75	

BB: Biceps Brachii; MC: Musculocutaneous; ABON: Anterior Obturator Branch; MB cyatic: Motor Branch of cyatic

DISCUSSION

The data collected at the chemical block outpatient clinic of a reference rehabilitation center for children reflect the profile of the conditions most commonly associated with muscle tone disorders. In the pediatric outpatient clinic, a high prevalence of patients with cerebral palsy (95%) was observed, with predominance of levels IV and V of the Gross Motor Function Classification System (GMFCS), accounting for 32% and 26%, respectively. Likewise, in another rehabilitation centre in the State of Sao Paulo, Toledo, et al [5] reported most patients with cerebral palsy were classified as GMFCS level IV (29%). In contrast, data from the Surveillance of Cerebral Palsy in Europe demonstrated predominance of individuals with less motor involvement, classified as GMFCS I and II (32% and 29%, respectively) [6]. These differences could be attributed to the care profile of the services assessed, since the individuals with mild cerebral palsy tend to require intensive rehabilitation for shorter periods. Moreover, they are often identified in population-based studies, whereas patients with more functional severity are seen at outpatient clinics of specialized rehabilitation centers.

In the pediatric sample evaluated, comprising patients aged 2 to 18 years with predominance of cerebral palsy, the use of phenol in the operating room by specialized physicians, in 2022 and 2023, was demonstrated to be safe, and no severe adverse effects were observed. The adverse event most frequently reported was pain in the site of injection, while 2.4% of patients presented transient weakness and 1.2% complained of malaise. Similar findings were described in a study with neurological patients submitted to 293 procedures, in which pain was also the most frequent adverse effect (4.0%), followed by edema (2.7%), dysesthesia (0.7%) and hypotension (0.7%). In this same study, the mean dose of phenol used per procedure was 10 mL [7], a value higher than that observed in our sample (6.3 ± 2.3 mL), probably due to age differences and, consequently, body weight of the populations assessed. No studies with a larger sample of pediatric patients submitted to neurolytic block with phenol were found. The data related to chemical blocks with phenol were obtained from procedures performed before withdrawal by the National Health Surveillance Agency (ANVISA, acronym in Portuguese), as per Resolution number 2,384, of June 24, 2024 [8].

In the pediatric outpatient clinic, the positioning goal (standing up, use of wheelchair use, sitting on bed) was the most common (79%), followed by orthotic management (62%); in that, the goals were more related to quality of life and prevention of deformities than to function. The goals were fully or partially achieved in 90% of procedures in the pediatric outpatient clinic Hence, the blocks were well indicated by the physiatrists of the organization, setting real and individualized therapeutic goals, and adjusting the intervention to the functional profile of patients.

The use of botulinum toxin type A (BTA) was more frequent (45.5%) when compared to phenol (21.7%), and this fact could be attributed to greater easiness of administering BTA at an outpatient setting, whereas phenol was mostly injected in the operating room under anesthesia, in pediatric patients. Even though phenol had an expressive use as a relevant therapeutic option, specially for children, in whom the BTA dose is limited by body weight. No statistically significant differences were observed in this study between use of BTA and phenol regarding reduction of spasticity evaluated by the Ashworth scale, achieving therapeutic goals, and range of motion of the compared joints. These findings suggest that both methods of block present similar clinical efficacy.

There is scarce literature comparing the use of phenol and BTA in management of spasticity, especially on the pediatric population. In a study of patients with cerebral palsy (n=61), BTA was superior to phenol in terms of achieving therapeutic goals, assessed by means of the Ashworth scale, range of motion, and functionality indices [9]. These findings contrast with the results of the present study, in which both treatments presented similar clinical outcomes. In a study of individuals with spinal cord injury [10], the anterior branch of obturator was the nerve more often treated (51.4% - 260 injections), with no report of adverse effects. This was corroborated by our study, in which the anterior branch of obturator was the nerve more frequently managed in all clinical diagnoses, accounting for 54.5% of injections (138 procedures).

The dose of BTA employed in studies of patients with cerebral palsy varies widely in the literature. There are reports of use of 12 U/kg of onabotulinum toxin A [11], whereas another study described an optimal dose of 20 U/kg [12]. Furthermore, Polak, et al. compared two doses (8 U/kg and 24 U/kg) and demosntrated better clinical outcomes in the group that received the higher dose, with no increased incidence of adverse effects. This finding was similar to that observed in the present study. On the other hand, another article did not specify the dose per kilogram of body weight, and only mentioned the total maximum dose employed, that is, five vials of abobotulinum toxin A [14].

The limitations of this study include missing data in reassessment visits at the pediatric outpatient clinic (2.4%), a fact that may occur due to inadequate completion of the follow-up form, and difficulties in providing social and financial support for the patient to attend appointments. Still, to increase objectivity of the goals, in addition to what has already been used (the Ashworth scale and range of motion), the Goal Attainment Scaling (GAS) 8 could be employed, with numerical measurement of the extent to which the objectives were or were not achieved [15].

CONCLUSIONS

No significant differences were observed between botulinum toxin type A and phenol in the clinical parameters assessed, indicating similar efficacy in both modalities to manage spasticity. In addition, the neurolytic blocks conducted by specialized professionals at a reference rehabilitation had low percentage and severity of adverse effects, emphasizing safety of these procedures when properly indicated and performed.

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