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Long-Term Comparison of Video-Assisted Thoracic Sympathectomy and Clinical Observation for the Treatment of Palmar Hyperhidrosis in Children Younger Than 14

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Abstract: **The results of video-assisted thoracic sympathectomy (VATS) in children are unknown. To investigate the improvement in quality of life (QOL) of a group of 45 children who did and did not undergo VATS for the treatment of palmar hyperhidrosis (PH) 4 years after the initial evaluation. Forty-five children with PH were initially evaluated. Children were divided into two groups: 30 in the VATS group and 15 in the control group. We studied the evolution of PH, negative effect of hyperhidrosis on the QOL before the treatment, and improvement in QOL after treatment. Twenty-five patients (83.4%) in the VATS group experienced great improvement in PH, and five (16.6%) experienced partial improvement; 12 (80.0%) children from the control group had some type of improvement, and three (20.0%) had partial improvement. Two (13.3%) children in the control group and 23 (76.7%) in the VATS group had great improvement in QOL. For children with PH and poor QOL, VATS is better than no treatment. It produces better results with regard to sweating and greater improvement in QOL.**

Palmar hyperhidrosis (PH) is a somatic disorder that results from hyperfunction of the sympathetic nervous system, usually during childhood (1,2). PH has a symmetric distribution and a similar prevalence in both sexes and affects 2.8% of the population (3). PH can lead to social, professional and emotional problems that are associated with low levels of quality of life (QOL) (4).

In adults, video-assisted thoracic sympathectomy (VATS) is the only definitive treatment option for PH. It is a safe procedure with good results (5), although it is associated with compensatory hyperhidrosis (CH), which occurs in virtually all patients with greater or lesser intensity, mainly on the trunk, with an unknown pathophysiology (6).

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In children, VATS has been used in daily practice, apparently with the same safety and good results as adults, although there are few scientific studies (7–16), especially for its indication in children. It is also unknown whether surgery performed on children younger than 14 produces better results than clinical management after a longer period of time. The best way to evaluate this question is to measure the QOL in these groups after a long period of time.

The aim of this study was to investigate the improvement in QOL of a group of 45 children who did or did not under VATS for the treatment of PH an average of 4 years after the initial evaluation.

PATIENTS AND METHODS

This was a prospective nonrandomized study performed in accordance with the ethical standards of the Ethics Committee for Analysis of Research Projects on Human Experimentation of the University of São Paulo, Clinicas Hospital.

Forty-five children with PH younger than 14 at the time of first consultation were initially evaluated between 2001 and 2007. Thirty children underwent VATS, and 15 children were in the control group and not treated with anything.

The distribution of age, sex, and weight at the first evaluation is presented in Table 1.

There was no difference between groups regarding sex ($p > 0.99$), but the patients in the VATS group had a greater mean age than the controls ($p = 0.03$).

The vascular surgery or thoracic surgery groups performed the VATS procedure. General anesthesia was used in all cases with selective intubation using a double lumen probe. The surgical technique was based on two mini-incisions in each hemithorax and ablation of the sympathetic chain at one level (T3 or T4).

The control patients were not operated or treated, based on decisions made by the families.

All patients underwent two evaluations for the purposes of this study. The first evaluation was done by review of the records and the second evaluation occurred 4 years after surgery Clinical improvement in PH was assessed using a clinical questionnaire, and the negative effect of PH on QOL improvement in QOL after the treatment using a protocol (17) (translated into English by de Campos) (18), and the occurrence of side effects were determined.

Patients answered a questionnaire about their clinical improvement according to their subjective perception of improvement in hyperhidrosis on a scale from 0 to 2 (0 = no improvement, 1 = partial improvement, and 2 = no hyperhidrosis).

The negative effect of hyperhidrosis on QOL before the treatment was classified into five different levels and calculated as the summed score from the protocol (range from 20 to 100): the higher the level, the greater the effect, and the poorer the QOL (> 84, very poor; 68–83, poor; 52–67, good; 36–51, very good; and 20–35, excellent).

Improvement in QOL after the treatment was classified using five levels (> 84, much worse; 68–83, worse; 52–67, no change; 36–51, some improvement; 20–35, much better).

Evolution of PH, negative effect of hyperhidrosis on QOL before treatment, and improvement in QOL after treatment were studied.

Statistical Analysis

The Fisher exact test was performed to verify the association between groups (VATS and control) and categorical variables (sex and QOL) using two by two tables, and the Student *t* test was used to compare the mean ages between the study patient groups. A 5% level of significance was used for all of the statistical tests.

RESULTS

Changes in PH after 4 years are presented in Table 2.

Pleural drainage was necessary in one case because of pneumothorax; the drain was removed within 48 hours. All patients had some degree of postoperative

TABLE 1. *Clinical and Sociodemographic Characteristics of Patients*

Variable	Category/Measures	VATSG Freq. (%)/Measures	NOG Freq. (%)/Measures	p
Age (years)	N	30	15	0.0297
	Range (Min–Max)	8–14	8–14	
	Median	13.0	11.0	
	Mean (±SD)	12.7 (±1.6)	11.5 (±1.9)	
Gender	Female	23 (76.7)	12 (80.0)	0.999*
	Male	7 (23.3)	3 (20.0)	

p-value obtained by Student *t* test.
*p-value obtained by Fisher exact test.

TABLE 2. *Improvement in Palmar Hyperhidrosis 4 Years After Surgery*

Treatment result	VATSG Freq. (%)	NOG Freq. (%)	p
No improvement	0 (00.0)	12 (80.0)	< 0.001
Partial improvement	5 (16.6)	3 (20.0)	
Absence of hyperhidrosis	25 (83.4)	0 (00.0)	
Total	30 (100)	15 (100)	

p-values were obtained using Fisher exact test.

pain, which was treated with analgesics and anti-inflammatory agents. In no case did the pain persist for longer than 45 days. We had no cases of Horner's syndrome.

Twenty-five patients (83.4%) in the VATS group experienced great improvement in PH, and five (16.6%) experienced partial improvement; 12 (80.0%) children in the control group had no improvement, and three (20.0%) had partial improvement.

CH was observed in 27 children who underwent VATS at the last assessment; 19 had slight CH and eight had severe CH. The most frequent locations were the abdomen (18) and back (25), then the thighs (7), buttocks (6), and lower legs (6).

The effect of hyperhidrosis on QOL in the first evaluation in 45 patients is presented in Table 3. Both groups had the same levels of QOL (poor or very poor) in the first evaluation (mean: VATS 88 ± 8, control 84 ± 9).

TABLE 3. *Impact of Hyperhidrosis on Quality of Life (QOL) in the First Evaluation in 45 Patients*

Level of QOL before treatment	VATSG Freq. (%)	NOG Freq. (%)	p
84–100 (very poor)	23 (76.7)	8 (53.3)	0.173
68–83 (poor)	7 (23.3)	7 (47.7)	
52–67 (good)	0	0	
36–51 (very good)	0	0	
20–35 (excellent)	0	0	
Total	30 (100)	15 (100)	

p-values were obtained using Fisher exact test.

TABLE 4. *Improvement in Quality of Life (QOL) after 4 Years*

Level of improvement	VATSG Freq. (%)	NOG Freq. (%)	p
20–35 (much better)	23 (76.7)	2 (13.3)	< 0.001
36–51 (a little better)	7 (23.3)	4 (26.7)	
52–67 (the same)	0	4 (26.7)	
68–83 (a little worse)	0	5 (33.3)	
84–100 (much worse)	0	0 (00.0)	
Total	30 (100)	15 (100)	

p-values were obtained using Fisher exact test considering "much better" versus "the same" or "a little better" or "a little worse."

Improvement in QOL is presented in Table 4. Two patients (13.3%) in the control group and 23 (76.7%) in the VATS group were much better than at the first evaluation.

DISCUSSION

The excellent results of VATS for the treatment of adult patients with PH, the high incidence of this condition and the suffering caused have led to increasing demand for treatment worldwide (19).

The symptoms of PH usually begin during childhood (20), and when parents seek medical help, they cannot find data from the literature to help them make an objective decision regarding the best time to use surgical treatment. In our study, the patients were all younger than 14 and represented fewer than 5% of patients that enter our hyperhidrosis outpatient clinic. We included only patients who were evaluated in 2002 to 2007, met the protocol of QOL, had indication of surgery, and were reassessed after a minimum of 4 years to determine the outcome after their sexual maturation.

Most patients who undergo surgery for PH in adulthood are female, and the children in this study were also predominantly female, probably because excessive sweating has greater repercussions in a girl's day-to-day life (21).

The children who sought medical assistance were discontent with their PH. The degree of negative effect on their QOL was measured in our study using a specific QOL questionnaire on hyperhidrosis (17) that has been validated for adults and used in several published studies (18). The degree to which hyperhidrosis worsens a patient's QOL depends on the severity of the condition and the patient's adaptation to each situation (22), even in childhood. Some children with milder hyperhidrosis have very poor QOL, but other children with very severe hyperhidrosis may report that their QOL is not so poor because they have adapted more successfully. All of the children in this study had poor or very poor QOL.

Almost all patients who are healthy can be treated with VATS except for small or obese patients, who might have a greater risk of CH after surgery and are a higher surgical risk (23). All children had indications for surgery, but 15 families did not agree and chose to continue observing the development of their children without the operation.

Previous studies that have included children have not been objective and have all been retrospective.

Cohen and colleagues (8) in 1998 evaluated 84 children and adolescents younger than 18 with PH who

underwent sympathectomy between 1992 and 1995. The authors found that this surgery is safe and effective, with low morbidity and no mortality, and concluded that satisfaction with this procedure was high, despite compensatory sweating.

Noppen and colleagues (9) studied pulmonary function before thoracic sympathectomy and 6 weeks and 6 months after surgery in 12 children aged 7 to 15 who underwent thoracoscopic sympathectomy for hyperhidrosis and found that the changes were minimal and of the same magnitude as in adults.

Imhof and colleagues (10) followed 19 children between 1969 and 1997 who underwent thoracoscopic sympathectomy of ganglia T2 and T3 using a questionnaire that was sent by mail. Although QOL was not assessed, they concluded after long-term monitoring that sympathectomy in children is safe.

Lin (11) studied 350 children and adolescents aged 5 to 17 who underwent to video-thoracoscopic sympathectomy of T2 ganglia for the treatment of PH between July 1994 and March 1998 and found minimal surgical complications and no surgical mortality. After a median follow-up of 25 months (range 5–44 months), anhidrosis was observed in 331 patients (94.6%), and 301 patients (86%) developed compensatory sweating on the trunk and lower limbs (armpit 12%, back 86%, abdomen 48%, legs 78%). The recurrence of PH was 0.6% in the first year, 1.1% in the second year, and 1.7% in the third year. In another article in the same year, Lin (12) included 88 more children aged 5 to 17 who underwent T2 and T3 sympathectomy for the treatment of axillary hyperhidrosis. One patient underwent unilateral sympathectomy because the original procedure was aborted because of the presence of pleural adhesions. The complication rate was minimal, and there was no mortality. The median follow-up was 25.2 months (range 4–45 months). The results were highly satisfactory in 408 patients (93.2%), but 377 (86%) developed compensatory sweating on the trunk and lower limbs (back 86%, abdomen 48%, lower limbs 78%, soles 1.4%). The recurrence rate of PH was 0.6% in the first year, 1.1% in the second year, and 1.7% in the third year.

Steiner and colleagues (13) in 2008 compared the results of sympathectomy in a group of 116 children younger than 14 with those of another group of 209 adolescents and adults aged 15 and older more than 24 months after surgery using a questionnaire administered over the telephone. They found that sympathectomy solved the problem in most patients and generated a level of satisfaction in the postoperative long term of 84.5%. Postoperative satisfaction was significantly higher in children than adolescents and adults (92.2% vs 80, 7%; $p = 0.005$). Most of the patients had compensatory sweating, which was observed 6 months after surgery in 81.8% of patients but less frequently in children (69.8% vs 88.5%; $p < 0.001$). They found that the presence of compensatory sweating of varying degrees of intensity was better tolerated and that postoperative satisfaction was higher in children.

We observed that children who reported CH presented such symptoms immediately after the surgery but only during periods of very hot weather, during exercise, and occasionally correlated with stress.

We did not use any objective measurement of sudoresis because the methods that were available only produce data at one specific point in time (24). There is no method capable of measuring hyperhidrosis over an entire day. For this reason, we asked the children to grade their improvement in three levels. After all, hyperhidrosis is disturbing but not dangerous, and the goal of any treatment is the patient's subjective improvement.

The results from the treatment of PH were more satisfactory in the VATS group. The children in the control group had QOL levels that were statistically lower. Palmar sudoresis was lower in more than 80% of the cases after surgery. The VATS group had an improvement of 76.7% with regard to QOL, but only a 20% improvement was noted in the control group.

The results of VATS are outstanding because more than 95% of patients become free of or show improvement in PH, although this improvement is often at the cost of CH (an irreversible increase in sudoresis in other parts of the body) (25).

The factors that are currently associated with a worsening of QOL after thoracic sympathectomy for the treatment of hyperhidrosis are surgical failure and severe CH (26), which were not present in our series. In contrast, we observed improvement in only six patients, and nine patients were the same or worse in the QOL evaluation with conservative treatment (controls).

We have shown that children younger than 14 with PH and low QOL have better results in improving their QOL after undergoing VATS.

CONCLUSION

For children with PH and poor QOL, VATS is better than conservative treatment because it produces better results with regard to sweating and greater improvement in QOL.

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