



Does clip removal help for compensatory hyperhidrosis complicating thoracic sympathetic clipping?

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Dear Editors,

Thoracic sympathectomy is a well-established treatment in the management of primary hyperhidrosis. However, compensatory hyperhidrosis (CH), which is an intense hyperhidrosis of unaffected areas before surgery, may complicate thoracic sympathectomy. Thoracic sympathetic clipping (TSC) may serve as a potential procedure to revert the operation in case of CH. However, it is unclear whether the unclipping is truly reversible. We analyzed our findings to clarify the possible reversible effect of TSC in patients with disabling CH who underwent subsequent clip removal. We also reviewed the relevant literature.

Among the 183 patients who underwent bilateral TSC with the diagnosis of primary hyperhidrosis, 96 (52.4%) patients were found to have CH. The severity of CH is mild in 7 (7.3%), embarrassing in 61 (63.5%) and disabling in 28 (29.2%) patients. Eight (4.3%) of the patients with disabling CH further underwent clip removal. Of these eight patients, six (75%) were males and two (25%) females with mean age of 29.6 ± 7.9 years (median = 32, range = 20–41). We performed TCS at the level of T2 for facial, T3 for palmar and T4 for axillary sweating. Three patients with isolated palmoplantar hyperhidrosis and facial hyperhidrosis previously had undergone T3–T4 and T2 TSC, respectively. Two patients with palmoplantar hyperhidrosis in addition to slight facial hyperhidrosis had undergone T2–T4 TSC. We used a

visual analog scale for satisfaction degree after clip removal, which was categorized as ‘much better’ (9–10), ‘better’ (6–8), ‘worse’ (3–5) and ‘much worse’ (0–2). We also evaluated the quality of life (QOL) as ‘excellent,’ ‘good,’ ‘poor’ and ‘very poor.’ The mean time from TSC to clip removal is 12.2 ± 10.9 months (median = 9, range = 1–30). The mean follow-up time after clip removal is 24 ± 7.1 months (median = 27, range = 10–31).

The satisfaction degree was reported as ‘much better’ and ‘better’ in two patients. However, it was ‘worse’ in five patients and ‘much worse’ in one patient. QOL was reported as ‘excellent’ and ‘good’ in two patients; however, it was ‘poor’ in five patients and ‘very poor’ in one patient, consistent with the satisfaction degree results. Only two (25%) patients had favorable results. One was a 35-year-old male with T3–T4 TSC who underwent clip removal after 11 months. His symptoms improved at postoperative 2 months. The other was a 21-year-old male with T2 TSC who underwent clip removal after 3 months. His symptoms improved at postoperative 6 months. Interestingly, improved primary symptoms on the hands and face of all eight patients did not recur after the clip removal.

According to Seddon’s classification, nerve damage occurs in three ways. Neurapraxia is a nerve compression injury resulting in a transient block without any axonal discontinuity. Axonotmesis, which occurs after TSC, is an axonal interruption and conduction failure with Wallerian degeneration of the distal myelinated fibers. However, Schwann cells within the endoneural and perineural sheaths remain intact, which may provide a possible recovery of nerve injury over weeks to months. Neurotmesis is a transection injury with connective tissue disruption of the sheaths in addition to axonal interruption. CS might have a potential reversibility with a rate between 48 and 77% [1]. However, Loscertales et al. consider TSC an irreversible procedure because they showed that irreversible changes such as

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Table 1 Series of clip removal following clipping sympathectomy for primary hyperhidrosis in the literature

Author	Year	No. of patients	No. of patients with clip removal (%)	Time range to clip removal	No. of improved patients (%)	Compensatory hyperhidrosis improvement (days)
Lin CC et al. [8]	1998	326	5 (1.5)	9–58 days	4 (80)	6–35
Lin TS et al. [9]	2004	102	2 (2.3)	N/A	2 (100)	2–13
Reisfeld et al. [11]	2006	1274	31 (2.4)	N/A	25 (80)	N/A
Chou SH et al. [10]	2006	464	13 (2.8)	N/A	10 (76)	60
Whitson et al.	2007	37	1 (2.7)	N/A	1 (100)	Several months
Kang et al. [6]	2008	116	14 (12)	7–56 days	9 (64)	30
Sugimura et al. [7]	2009	666	31 (4.6)	1–57 months	15 (48)	11–16 months
Hynes et al. [5]	2015	82	8 (9.7)	12 days–68 months	5 (62)	N/A
Current series	2018	183	8 (4.3)	1–30 months	2 (25)	2–6 months

N/A not available

Wallerian degeneration and the axonal loss occurred in the sympathetic chain within 10 days after clipping [2]. Likewise, degenerative irreversible changes occur at the sympathetic nerve after 45 days even if the clips are removed after 2 days [3]. On the other hand, severe histologic damage that remains visible 4 weeks after clip removal may decrease if the observation period is prolonged to 12 weeks provided that the clips are removed after 7 days [4].

Clip removal time also appears to be an important issue for the improvement of CS. Hynes et al. recommend early clip removal within 2 weeks. They reported that all patients who had clip removal within 3 months recovered from CH. They showed reversal in 62% of their patients (Table 1) [5]. However, Kang et al. reported that early unclipping does not always guarantee satisfactory recovery from CH. Their reversal rate was 78% [6]. The largest series reported to date by Sugimura et al. showed that 48% of their 31 patients improved after a median time of 11 months after unclipping. [7]. Similarly, 80% of patients recovered from CH within a couple of months in another study [8]. Lin et al. showed improvement in 84% of 102 patients with CH in a series. Two (2.3%) of the patients were unclipped with improvement on the 2nd and 13th days [9]. Chou SH et al. and Reisfeld et al. reported almost similar rates of improvement at 80% [10, 11]. Contrarily, we only had two patients (25%) with improvement. However, even after unclipping, all of our patients still had dry hands and faces provided at the initial TCS operation. Similarly, Sugimura et al. reported that 42% of their cases had no recurrence of their primary hyperhidrosis following clip removal. Although controversy exists regarding the effect of early removal of the clips, our unfavorable results might be attributed to the late removal

of the clips within a median time of 9 months. However, the consensus of the International Society of Sympathetic Surgery states that unclipping has a placebo effect. This is plausible, especially for the patients in whom recurrent primary hyperhidrosis is not observed. Moreover, the basis for unclipping is empirical and has no proven scientific ground according to this consensus [12].

In conclusion, CH is a common devastating complication following TCS. Although TSC may have a potential reversible effect, unclipping does not always help for CH. However, the improvement in primary hyperhidrosis may remain the same after unclipping.

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Compliance with ethical standards

Conflict of interest The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical standards Our study has been performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. This is a retrospective study on a series of patients who underwent clip removal following a thoracic sympathetic clipping for primary hyperhidrosis, and for this type of study formal consent is not required.

Appendix

See Table 2.

Table 2 Clinical features and outcome of the patients who underwent clip removal following thoracic sympathectomy

Gender	Age	BMI	Smoking status	Location of hyperhidrosis	Level of sympathectomy	Time to clip removal (months)	Follow-up (months)	Improvement time (months)	Satisfaction degree after surgery	Quality of life
Female	20	25	No	F + PP	T2–T4	14	27	–	Much worse	Very poor
Male	21	23	Yes	PP	T3–T4	1	27	–	Worse	Poor
Male	32	31	Yes	F + PP	T2–T4	30	31	–	Worse	Poor
Male	35	25	No	PP	T3–T4	11	20	2	Better	Good
Male	32	27	Yes	F	T2	4	19	–	Worse	Poor
Male	21	23	No	F	T2	3	10	6	Much better	Excellent
Female	35	22	No	PP	T3–T4	8	28	–	Worse	Poor
Male	41	29	Yes	F	T2	27	30	–	Much worse	Poor

BMI Body mass index; F facial; PP palmoplantar

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