Chapter 9

Summary and Conclusions
SUMMARY AND CONCLUSIONS

This thesis describes the outcome of sympathetic surgery in the thoracic cavity and consists of two parts and a pivotal general article comparing robotic surgery to endoscopic surgery. The first three articles describe the long-term outcome of endoscopic thoracic sympathectomy for the indications of digital ischemia, hyperhidrosis and excessive facial blushing.

In the last three articles the focus is on the use of the Da Vinci® robot to perform a more selective thoracic sympathectomy and the results of this innovative technique for the most common indication of hyperhidrosis.

Part 1: Long-term results of endoscopic thoracic sympathectomy

Chapter 2 provides a summary of the available evidence in the international literature of the long-term effects of thoracic sympathectomy (TS) and/or endoscopic thoracic sympathectomy (ETS) in the management of upper limb ischemia.

Only eighteen studies were included, none of them randomized controlled trials. Despite the many shortcomings in study design, lack of uniformity in terminology and surgical procedures and absence of hard endpoints of the available evidence, there seems to be benefits of TS in the setting of upper extremity ischemia. In particular, in the management of digital skin ulceration, maximizing tissue preservation or prevention of amputation was frequently reported.

TS appears to have solid long-term results in the treatment of Secondary Raynaud’s Phenomenon, contrary to Primary Raynaud’s Disease, were the benefit was limited to the first six-months post-operatively in most cases. Nevertheless, due to the minimal invasiveness and low reported incidence of major complications or adverse effects, thoracoscopic sympathectomy remains a therapeutic option in the treatment of severe Primary and Secondary Raynaud’s Disease/Phenomenon.

In chapter 3 we evaluate our long-term results of Endoscopic Thoracic Sympathectomy (ETS) in the management of upper limb ischemia (ULI) over a period of 15 years. End points of this retrospective study in thirty-five patients are long-term success, morbidity and overall patient satisfaction.

Long-term beneficial effects were reported in 53%, overall patient satisfaction was 56% and the cumbersome side effect of Compensatory sweating was experienced by 11 patients (58%).

Although the long-term efficacy of ETS in the management of upper limb ischemic disorders was moderate in our study, we still consider ETS worthwhile in the management of upper limb ischemic disorders due to its minimal invasive character, especially in addition to prior revascularization or angioplasty.
The most common indication for ETS is sweating of the armpits and hands. ETS can also be used in the management of Excessive blushing. In chapter 4 we report the long-term morbidity, success and overall patient satisfaction rates in patients operated in our department for either upper limb hyperhidrosis or facial blushing and sweating between January 1994 and December 2006.

We performed bilateral thoracoscopic sympathectomies in 73 patients without perioperative mortalities.

The initial success rate was 88% but patient satisfaction rate was only 56%. CS was present in 42 patients (68%). Long-term satisfaction rates per initial indication group were 42% for facial blushing and 65% for hyperhidrosis (n.s.), and CS was present in 79% vs 61%, respectively. Long-term satisfaction rates of ETS are severely hampered by a high incidence of disturbing compensatory sweating especially in patients treated for facial blushing.

ETS appears a safe treatment for upper limb hyperhidrosis with acceptable long-term results.

For excessive blushing, however, long-term satisfaction rates are severely hampered by a high incidence of disturbing compensatory sweating. ETS should only be indicated in patients with unbearable symptoms refractory to non-surgical treatment. The patient information must include the long-term substantial risk for severe CS and regret of the procedure.

Because of this substantial risk for severe CS we decided to perform a more selective transection technique of the sympathetic system than the technique used until then: the rib oriented removal of the second, third and fourth thoracic sympathetic ganglion.

We introduced the technique of selective postganglionic sympathectomy where the rami communicantes of the 2nd-4th ganglion are transected. Gossot et al. already described this technique but they decided it was too difficult to perform thoracoscopically.

By using the 3D vision, the magnification and the endowrist system of the Da Vinci® robotic system we managed to perform this operation in a standardized and reproducible way with excellent results.

In Chapter 5 we describe how we established already in 2003 that the Da Vinci® robotic system permits standardized minimal invasive surgical exercises to be performed quicker and more efficiently than traditional minimally invasive techniques. We think that with the aid of this robotic system, difficult endoscopic interventions may become easier to perform, and indications for minimal invasive surgery may be expanded. Therefore we started to use the Da Vinci® robot to perform the selective postganglionic sympathectomy.
Part 2: Robotic selective postganglionic thoracic sympathectomy

Before using this new robotic technique in patients we evaluated the feasibility in a swine model. In chapter 6 we conclude that robot-assisted thoracoscopic T2–T5 ramicotomy is feasible and effective in a swine model. The use of the DaVinci robot enables us to perform this operation, which is not easily accomplished by conventional thoracoscopy, in a safe and controlled manner within a reasonable operation time.

In chapter 7 we describe the technique of Robotic transthoracic selective postganglionic efferent sympathectomy for hyperhidrosis and the result of this technique in 55 patients.

There has been complete relief of hyperhidrosis in 53/55 (96%) patients, partial relief in 2/55 (4%) patients and a compensatory hyperhidrosis rate of 7%.

In chapter 8 the success of bilateral selective postganglionic thoracic sympathectomy using robotic technology for the treatment of hyperhidrosis was assessed in 55 patients by intraoperative temperature measurement of the ipsilateral upper extremity, patient interviews, and scoring of the symptomatic nature of hyperhidrosis based on the Hyperhidrosis Disease Severity Scale.

In thesis we demonstrate that the technique of transecting the rami communicates without transecting the sympathetic chain (ramicotomy) is easily feasible using the Da Vinci® Robot. There is an excellent relief of hyperhidrosis and a low rate of compensatory sweating and complications.

Robotic thoracoscopic selective sympathectomy is a ganglion-oriented technique where the upper five ganglia of the sympathetic chain are identified and exposed. This probably explains the high rate of immediate success compared to less accurate rib oriented techniques.

The low rate of compensatory sweating is probably due to the fact that by leaving the sympathetic chain intact there is less disruption of the Sympathetic nervous system, causing less compensatory sweating.

Nevertheless there is still place for a randomized controlled trial comparing classical thoracoscopic sympathectomy with selective thoracoscopic sympathectomy for the indication of hyperhidrosis.

In overall conclusion, Robotic thoracoscopic selective sympathectomy is an effective, feasible, and safe procedure with excellent relief of hyperhidrosis and low rates of compensatory sweating and complications.