

# ROBOTIC BRACHIAL PLEXUS DISSECTION

G. MANTOVANI

Sao Paulo Hand Center, Hand Surgery and Robotic Surgery

---

CORSO D'ISTRUZIONE: LA DISSEZIONE ANATOMICA DELL'ARTO SUPERIORE

---

The aim of this research was to develop an effective minimally invasive approach to brachial plexus surgery and to determine the feasibility of using telerobotic manipulation to perform a diagnostic dissection and microsurgical repair of the brachial plexus utilizing an entirely endoscopic approach.

On the initial study trials on fresh human cadaver brachial plexuses, an endoscopic approach was performed using 3 supraclavicular portals with the aid of the da Vinci telemanipulation system. Dissection was facilitated inflating the area with CO<sub>2</sub> at 4 mm Hg pressure. The normal supraclavicular plexus was dissected in its entirety to confirm the feasibility of a complete supraclavicular brachial plexus diagnostic exploration. Subsequently, an artificial lesion to the upper trunk was created, and nerve graft reconstruction was performed. Images and video of the entire procedure were obtained and edited to illustrate the technique.

All supraclavicular structures of the brachial plexus could be safely dissected and identified, similar to the experience in open surgery. The reconstruction of the upper trunk with nerve graft was successfully completed using an epineural microsurgical suture technique performed exclusively with the aid of the robot. There were no instances of inadvertent macroscopic damage to the vascular and nervous structures involved. The anatomical knowledge on this area was mandatory and relevant in order to understand the found anatomy

during the endoscopic dissection, and a learning curve on this aspect was one of the difficulties found on the research.

The major concern about the clinical use of this technique relies on the difficulties on dissecting the scar tissue present on the brachial plexus after a couple of weeks or months, at the regular timing those surgeries are usually performed. In that way we believe this dissection through an endoscopic approach may be not technically feasible with the actual instruments, however the use of this technique on the acute presentation of a brachial plexus injury must not face this drawback.

This technique was clinically validated on 2011 with 2 cases at University of Strasbourg, performed by one of the authors of this research, prof. Philippe Liverneaux, both cases for exploration of brachial plexus and biopsy of neural tumor, meaning not a dissection of previously damaged plexus with concurrent scar tissue.

In conclusion, after the experience in human fresh cadavers, and the first clinical cases, an endoscopic approach to the brachial plexus is feasible. The use of the robot makes it possible to perform microsurgical procedures in a very small space with telemanipulation and minimally invasive techniques. The ability to perform a minimally invasive procedure to explore and repair a brachial plexus injury may provide a new option in the acute management of these injuries, and may change in the future its algorithm of treatment.