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# Neurological Study of Radial Nerve Conduction During Endoscopic Radial Artery Harvesting:An Intra-Operative Evaluation

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ARTICLE INFO	ABSTRACT	
Article type: Case report	Endoscopic radial artery harvesting (ERAH) is a feasible and attractive minimally invasive approach for conduit procurement, however there have been concerns about a potential neurological damage occurring at the barvest limb site secondary to injury	
<i>Article history:</i> Received: 21 March 2014 Revised: 10 April 2014 Accepted: 15 Jul 2014	of the radial nerve during endoscopic harvesting. We present a case of ERAH in which we evaluated intraoperatively the characteristics of radial nerve conduction by means of electroneuromyography (ENM) during harvesting. No pathological changes of nerve conduction were detected at the harvest limb site during surgery and postoperatively thereby supporting the benefits of the endoscopic approach in terms	
<i>Keywords:</i> Endoscopic Harvesting Nerve Conduction Radial Artery Radial Nerve	of neurological outcomes following radial artery procurements with a less invasive approach.	

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# Introduction

Endoscopic radial artery harvesting (ERAH) has emerged in recent years as an attractive alternative approach to conventional open harvesting technique and several reports previously demonstrated the feasibility and safety of this novel approach for radial artery procurement (1,2). Despite the obvious advantages related to the use of a minimally invasive approach, such as a reduced incidence of wound complications and improved cosmetics, there have been controversial results about the persistence of potential impairment at the harvest limb site during endoscopic radial artery harvesting, mostly in relation with a damage occurring at the radial nerve (3).

We therefore sought to evaluate the potential alterations occurring in terms of radial nerve conduction intraoperatively during ERAH by means of electroneuromiography (ENM).

# **Case Presentation**

A 51-year-old woman was diagnosed with intracranial meningioma and admitted to Division of Cardiac Surgery, University of Brescia Medical School, Brescia, Italy in order to undergo an extra-intracranial high-flow bypass with the use of a radial artery as the conduit of choice. The patient signed an informed consent for the procedure.

Following confirmation of a negative Allen test at the non-dominant arm, endoscopic radial artery harvesting was performed by means of a non-sealed system combining a reusable stainless steel retractor (Karl Storz, Tuttlingen, Germany) and a disposable vessel sealing system (Ligasure, Covidien, Boulder, CO): as previously described (4), a 2 cm longitudinal incision was performed on the volar surface of the forearm, at the level of the radial styloid prominence. Once the radial artery has been separated as a pedicled conduit

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**Figure 1.** (A) Pacing electrode applied along the course of the radial nerve during ERAH procedure; (B) Recording electrodes (anode and cathode), placed around the thumb of the ipsilateral limb; ground electrode positioned on the palm between the pacing site

from the surrounding structures under direct vision, the endoscopic retractor was advanced and endoscopic harvesting started: first, the fascia between the brachioradialis and flexor carpi muscle was divided up to the proximal end of the radial artery (at the level of the antecubital fossa); then, the brachioradialis side and finally the flexor carpi side were dissected just by means of the endoscopic retractor and the vessel sealing system.

Throughout the harvesting procedure (either under direct vision or during the endoscopic phase) an ENM was performed at the harvest limb site in order to evaluate the amplitude and latency of sensory nerve action potentials (SNAPs) of the radial nerve. Different kinds of electrodes were utilized: first, a pacing electrode (SpesMedica, Genova, Italy) was applied along the course of the radial nerve, at the mid-level of the forearm (Figure 1 A); two recording electrodes (SpesMedica, Genova, Italy), respectively anode and cathode, were placed around the thumb of the ipsilateral limb and finally a ground electrode (SpesMedica, Genova, Italy) was positioned on the palm between the pacing site and the recording site in order to reduce potential signal interference (Figure 1 B).

A single pacing of mean amplitude 170 V at frequency of 1 Hz, lasting 0,1 ms, was applied on volar surface of forearm about 2-3 cm after the

 Table 1. Amplitude and latency of SNAPs1 of radial nerve during ERAH

Stimulus (Time)	Latency of SNAPs <sup>1</sup>	Amplitude of	
	(m/s)	SNAPs <sup>1</sup> (µV)	
T0:	2.8	5	
T1:	2.8	5	
T2:	2.8	5	
T3:	2.7	5	
T4:	2.6	6	
T5:	2.8	5	
T6:	2.9	5	
1. SNAPs: sensory nerve action potentials			

incision on the wrist, along the radial nerve course, before the start of ERAH procedure (T0), at the first steps of harvesting under direct vision (T1) and about every five minutes during the phases of endoscopic harvesting (T2-T6). The different time points of recording are outlined in Table 1. Normal range for latency of SNAPs are < 3.0 msec, while for amplitude of SNAPs are  $4.6-6.2 \ \mu\text{V}$ .

As shown in Table 1, ENM did not depict any abnormal values in terms of radial nerve conduction during the endoscopic harvesting of the radial artery. At clinical evaluation, no paresthesia or impaired sensibility at the harvest site was reported during the postoperative stay.

#### Discussion

Neurological disturbances following conventional radial artery harvesting approach have been reported to occur within an extremely wide range, that is, from 0 to 86% (3). The mechanisms of nervous injury following radial artery harvesting can be multifactorial: direct damage to the nerves in the forearm, the use of cautery and mechanical traction. A relevant advantage of an endoscopic approach is related to the possibility to avoid injury to the lateral cutaneous antebrachial nerve, which instead can be injured with the open technique. However, there are conflicting results reported in literature to date with respect to the incidence of neurological disturbances following endoscopic radial artery harvesting (3). The use of different techniques for endoscopic radial procurement may impact the incidence of such complications, in particular the use of novel technologies allowing for reduced thermal spread and limited nervous irritation could yield potential advantages. In our routine clinical experience (as well as in the current clinical report) we combine a reusable retractor along with a vessel sealing system with bipolar radiofrequency and a tissue

impedance algorithm which allows for a tailored energy delivery and adjustment with minimal thermal spread. The possibility to monitor intraoperatively the radial nerve conduction via ENM provided us with a unique opportunity to demonstrate that endoscopic radial artery harvesting with our current approach does not alter nerve conduction.

## Conclusion

Further studies on a larger series of patients along with a comprehensive postoperative clinical evaluation are warranted in order to confirm the real impact of neurological sequelae following endoscopic procurement of the radial artery, albeit this study demonstrated for the first time that this minimally invasive technique does not directly cause radial nerve conduction abnormalities.

## **Conflict of Interest**

The authors declare no conflict of interest.

#### References

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