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TOPICAL REVIEW

Predictive value of assessment of disc-radicular conflict of the cervical segment by somatosensory evoked potentials

Titlic M[1,2], Kolic K[3], Fiorentini F[2], Josipovic-Jelic Z[4]

Department of Neurology, University Hospital Split, Split, Croatia. **marina.titlic@gmail.com**

Abstract: Somatosensory evoked potentials (SSEP) of the n. medianus, with clinically significant neurological findings helps in diagnosing a number of different cervical spine lesions. SSEP of the n. medianus and neurological observations also aid in diagnosticis of the disc-radicular conflict. A final diagnosis is set by the computerised tomography (CT). The tested positive predictive value of assessment of disc-radicular conflict of the cervical spine by means of SSEP is 87 %. The 95 % confidence interval (CI) is 0.87 (0.81–0.93) *(Tab. 3, Fig. 4, Ref. 23)*. Full Text (Free, PDF) *www.bmj.sk.*
Key words: SSEP, n. medianus, cervical, intervertebral disc.

Somatosensory evoked potentials (SSEP) are biopotentials passing through the spinal cord. SSEP of the n. medianus is determined by evoked responses, such as neurogram, spinogram and cortical response. Evoked responses are assessed both qualitatively and quantitatively. Qualitative assessment is a descriptive presentation, whereas the quantitative valuation is based on determining of the revoked response latency and amplitude. The latency is expressed presented in milliseconds (ms) and amplitude in microvolts (μV). Repeatability of the evoked response is assessed as well, which is characteristically changed in some diseases (1, 2).

Computerised tomography (CT) is a radiological method of presenting a body in cross-sections by means of X-rays and computed processing of the digitalised images. CT enables detection of very small differences in the presented structures density, that is, in the x-ray absorption coefficient (3).

The subject matter of our research is the specific quality of SSEP in the diagnostics of the disc-radicular conflict.

The base for the assessment are predictive values of SSEP of the n. medianus as compared to the CT of the cervical spine.

Patients and methods

The research included patients with clinical signs and symptoms of the cervical disc-radicular conflict and with positive findings of the somatosensory evoked potentials (SSEP) of the n. medianus. All subjects arehave established their basic anthropological properties (age, sex, height, body mass index). Height is measured in centimetres. Body mass index is classified by the body mass index into four categories: undernourished (below 18.5 kg/m^2), normal body weight (18.5 to 25 kg/m^2), overweight (25 to 30 kg/m^2), and adiposity (over 30 kg/m^2).

Clinical neurological examination (myotatic reflexes of m. biceps brachii and m. brachialis, rough strength of hands, finger flexor strength) of all the subjects revealed possiblerobable cervical spine disc-radicular conflict.

SSEP of the n. medianus was assessed made using by the apparatus Medelec Synergy – Oxford Instruments. RResults of the SSEP of n. medianus wereas qualitatively divided into three groups: mild changes, medium severe changes, very severe changes.

All the subjects underwent computerised tomography (CT) of the cervical spine. CT was performed made by the spiral CT apparatus Siemens Somatom EMOTION 2000.

Tab. 1. Anthropological properties of subjects with probable cervical spine disc-radicular conflict.

Sex	Male	Female
Number of subjects n (%)	46 (38.3)	74 (61.7)
Mean age (years)	67.4±4.1	49.2±3.6
Average height (cm)	179±4.9	168±3.2
BMI>25 kg/m^2 n (%)	28 (60.8)	49 (66.2)

Tab. 2. Findings of SSEP of the n. medianus by qualitative changes of the evoked responses.

SSEP n. medianus changed evoked response	n (%)
Medium severe	64 (53.3)
Very severe	56 (46.7)
Total	120 (100)

[1]Department of Neurology, University Hospital Split, Split, Croatia, [2]University of Split, Split, Croatia, [3]Department of Radiology, University Hospital Split, Split, Croatia, and [4]Private Cinic, Zagreb, Croatia

Address for correspondence: M. Titlic, MD PhD, Dept of Neurology, University Hospital Split, Spinciceva 1, 21 000 Split, Croatia.
Phone: +385.21556426, Fax: +385.21556675

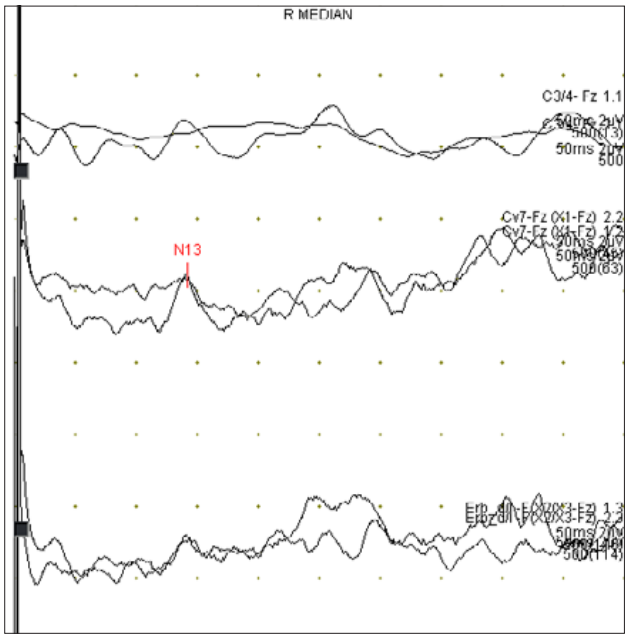

Fig. 1. SSEP of the n. medianus – neurogram and spinogram of a normal evoked response, the cortical response being of markedly low amplitude and hard to differentiate.

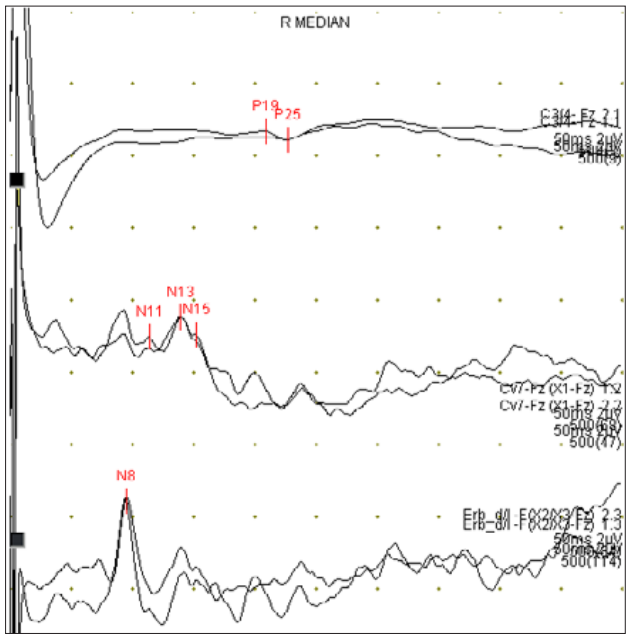

Fig. 2. SSEP of the n. medianus – normal neurogram and cervical evoked response, whereas the cortical response is of markedly low amplitude.

The qualitative data (sex) were analysed by frequency tables, whereas quantitative tests (numeric) data are described by arithmetic median. The 95 % confidence interval (CI) of the disc-radicular conflict was calculated by the Miettenan's formula.

Results

The research includesd 120 patients, by means of medical history, neurological examination and SSEP of the n. medianus established probable cervical spine disc-radicular conflict. Anthropologically differentiated are men and women with probableossible cervical spine disc-radicular conflict (Tab. 1).

SSEP of the n. medianus are differentiated as normal findings, mildly severe changes and very severe changes, based upon the evoked responses (Figs 1 and 2).

Results of SSEP of the n. medianus qualitatively differentiated as medium severe changes and very severe changes are considered a probable diagnostics mean of the cervical spine disc-radicular conflict (Tab. 2).

All 120 subjects with neurologically possible and under SSEP of the n. medianus probable disc-radicular conflict were subjected to CT of the cervical spine. CT images of intervertebral (i.v.) discs show protrusion of the i.v. disc with disc-radicular conflict (Figs 3 and 4).

We correlated neurological examination and SSEP of the n. medianus of probable cervical spine disc-radicular conflict with CT findings (Tab. 3).

Frequency of confirmation of probable findings of SSEP of the n. medianus by CT is statistically significant. Of the 120 subjects assessed by neurological examination and SSEP of the n. medianus as probable cases of cervical spine disc-radicular conflict, only 16 subjects were falsely positive, the remaining 104 being assessed correctly. The positive predictive value is 87 %. The 95 % confidence interval, that is, 95 % of CI is 0.87 (0.81–0.93).

Tab. 3. Correlation of SSEP of the n. medianus and CT of the cervical spine.

Disc-radicular conflict	SSEP n. medianus n (%)	CT of cervical spine n (%)
positive findings	120 (100)	104 (87)
negative findings	0 (0)	16 (13.4)

Discussion

The disc-radicular conflict diagnostics is made by clinical examination supplemented by neurological diagnostic methods and neuro-radiological examination (3). The research includes patients who were by diagnostic examination established as the needing of further neurological diagnostic examination, in particular by somatosensory evoked potentials (SSEP). SSEP of the n. medianus follows the sensory path from periphery to presentation on the cortex. All the patients with probable lesions of the cervical spine (disck-reticular conflict) diagnosed by SSEP of the n. medianus were further examined neuro-radiologically, that is, by CT of the cervical spine. Findings of probable disc-radicular conflict were correlated with definite findings established by CT, and the predictive value of the disc-radicular conflict was established.

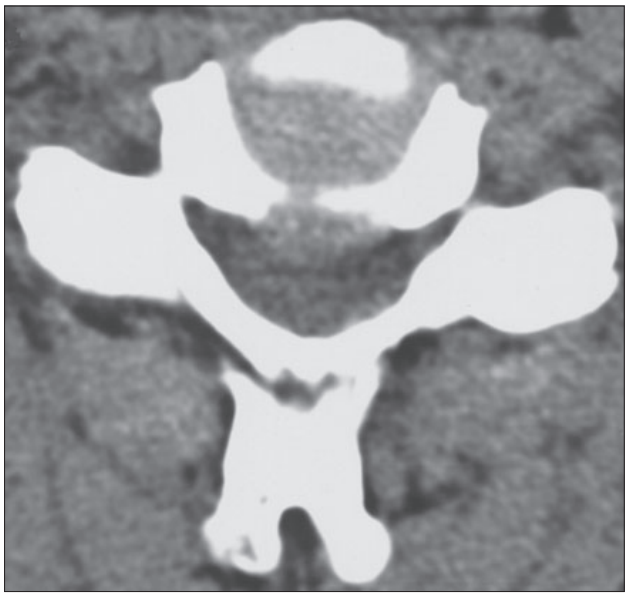

Fig. 3. CT of the cervical spine – protrusion of the intervertebral disc at the C5/C6 level.

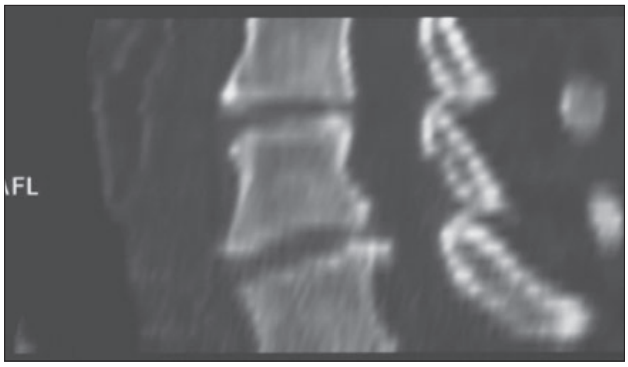

Fig. 4. CT of the cervical spine – reconstruction in the bone window.

Numerous researcheds showed that CT is the method of choice in diagnostics of the cervical spine lesions. CT of the cervical spine is being used in diagnostics of painful syndromes of the cervical spine, cervical spine injuries, disc-radicular conflicts, changes of small joints, flexion and extension damages, cervical spine subluxation, axial compression, as well as disorders of soft tissues and ligaments (4–10).

Research results have confirmed significant specific quality of SSEP of the n. medianus in assessing of a possible disc-radicular conflict. Clinical assessment and confirmation of the said lesions by SSEP of the n. medianus enable assessment of severity of the lesion requiring further diagnostic examination. The basic neuro-radiological imaging of a disc-radicular conflict is the CT.

Other authors, too, state significant role of SSEP in diagnosing of the cervical spine lesions, such as cervical spondylosis, spine injuries, etc. (11, 12). SSEP has an important role in diagnosing of spinal cord diseases and damages, e.g.: myelopathy, cervical cord tumours, tonsillar herniation, infarctions and haemorrhages of the pons, damages of the thalamus, etc. (13). SSEP helps in assessing ofthe severity of damages and following up ofthe atlantodental ossification and ankylosis (14). The method is also helpful in following up of courses of scoliosis surgeries of scoliosis, carotid endarterectomy, thoracoabdominal aorta, and cervical spine (15–18). This method is of great help to clinicians in diagnosing of numerous diseases such as the Brown-Sequard syndrome, tubercular spondylodiscitis, syringomyelia, but as an integral part of intensive care units (19–23).

To conclude, SSEP is of great help in diagnosing of a great number of diseases of the spine and the spinal cord, as well as in following up of surgery procedures, recoveries and restoration to health. With clinical neurological examination, SSEP makes the basis of clinical examination of spine and spinal cord diseases, including the disc-radicular conflict. An advantage of the method is the possibility of repeating of the examination with no harmful effects, and the possibility of following the disease up.

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