

# EVALUATION OF EXTERNAL ANAL SPHINCTER INNERVATION ASYMMETRY IN OBSTETRICS

Vita Zacesta<sup>1</sup>, Dace Rezeberga<sup>1</sup>, Haralds Plaudis<sup>2</sup>, Kristina Drusany-Staric<sup>3</sup>, Corrado Cescon<sup>4</sup>

<sup>1</sup> Riga Stradins University, <sup>2</sup> Riga East Clinical University Hospital, <sup>3</sup> University Medical Centre Ljubljana, <sup>4</sup> Rehabilitation Research Laboratory 2rLab, Department of Business Economics, Health and Social Care, University of Applied Sciences and Arts of Southern Switzerland, Manno, Switzerland.

## Introduction

Episiotomy is the most common cause of perineal trauma during delivery, and the surgical incision is usually performed on the mediolateral right side. Recent studies suggest that functional asymmetry of pelvic floor innervation exists in healthy subjects, and it is strongly associated with postpartum incontinence if the trauma occurs on the dominant side of innervation. Surface electromyography (sEMG) in obstetrics is a novel method for detecting the innervation of external anal sphincter (EAS).

## Study aim

The aim of this study is to locate the IZs of EAS by the means of sEMG, and to analyze their distribution, in order to evaluate the effect of episiotomy on the EAS muscle activity.

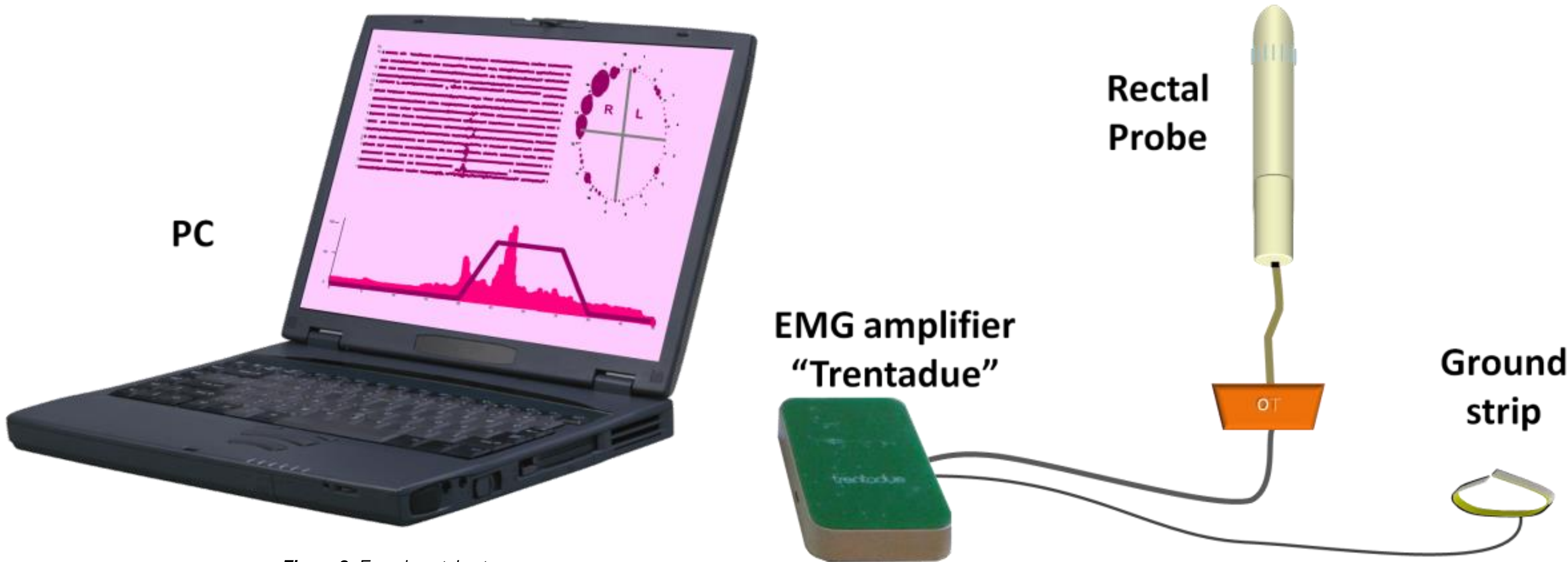


Figure 2. Experimental set-up.

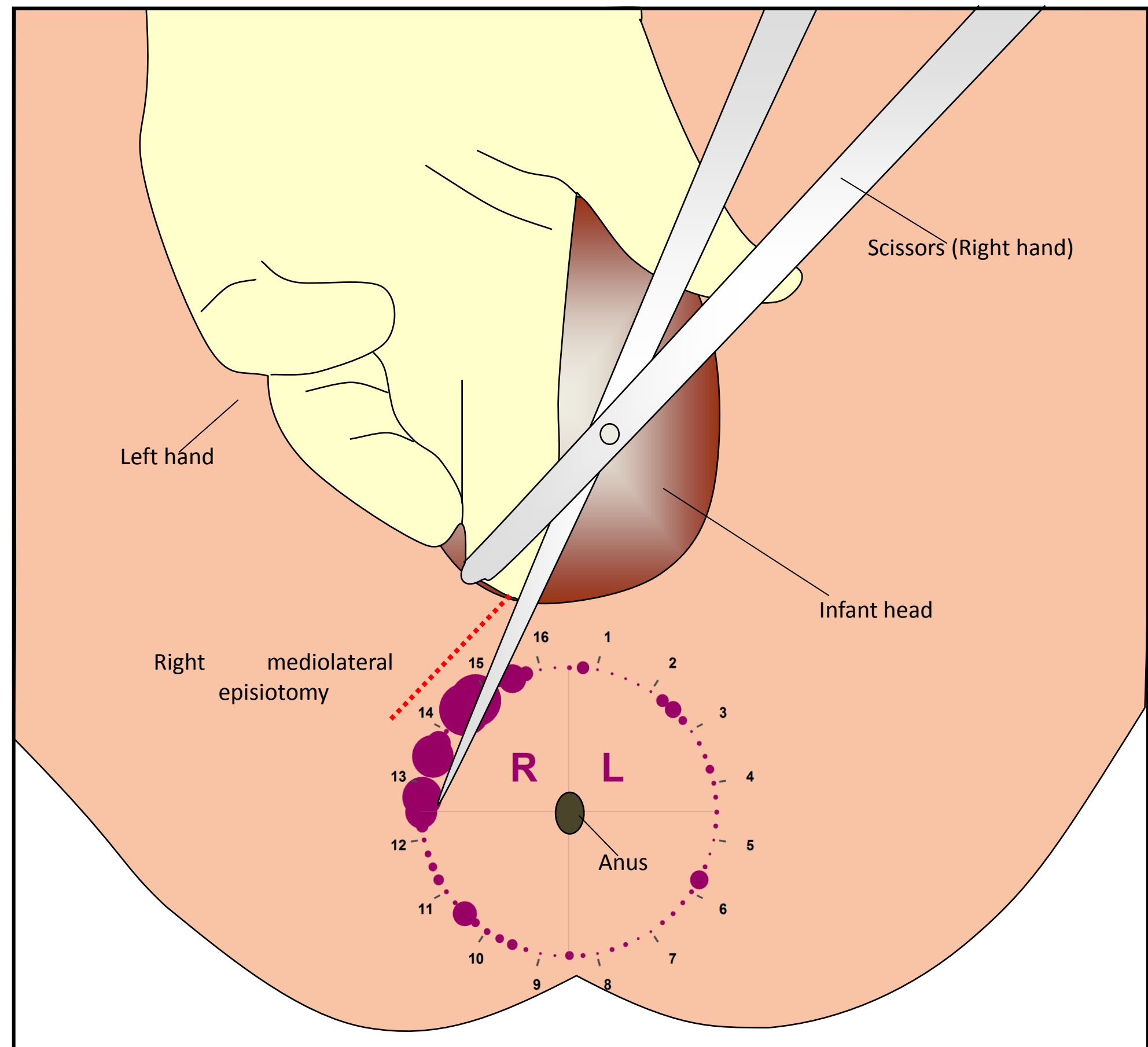


Figure 1. Representation of right episiotomy. The IZs are on the right side, and routine episiotomy would damage them.

## Methods

In this prospective observational type study, 225 pregnant nulliparous women (age  $28.4 \pm 4.1$  years) were involved. In order to detect the distribution of IZs and amplitude of EMG signals, sEMG was performed of EAS two times: during the 2<sup>nd</sup> trimester and 6-8 weeks after delivery.

Also endoanal ultrasound, Longo score assessment and faecal incontinence score (FISI) were performed during all visits in order to exclude possible sphincter damages. EMG signals were detected by a cylindrical probe with 16 electrodes and acquired with a multichannel amplifier (Trentadue, OT Bioelettronica, Turin, Italy).

## Results

The women were divided in two groups according to the EAS innervation asymmetry: left or right dominantly innervated. The changes of signal amplitude were analyzed in subgroups according to the delivery mode (no damage, spontaneous lacerations, caesarean sections and right side episiotomies). Out of the 225 women analyzed before delivery, 149 women who returned for the second measurement after application of exclusion criteria were used for further analysis: 56 (38%) of them had episiotomy on the right side, 44 (30%) had spontaneous lacerations, 20 (13%) had no damage, and 29 (19%) had Caesarean section. The innervation was observed to be heterogeneous with a tendency of asymmetry predominant on the right side 138 (61%) compared to the 87 women (39%) innervated on the left side. None of the women had any sphincter damage before pregnancy or wound complications after delivery.

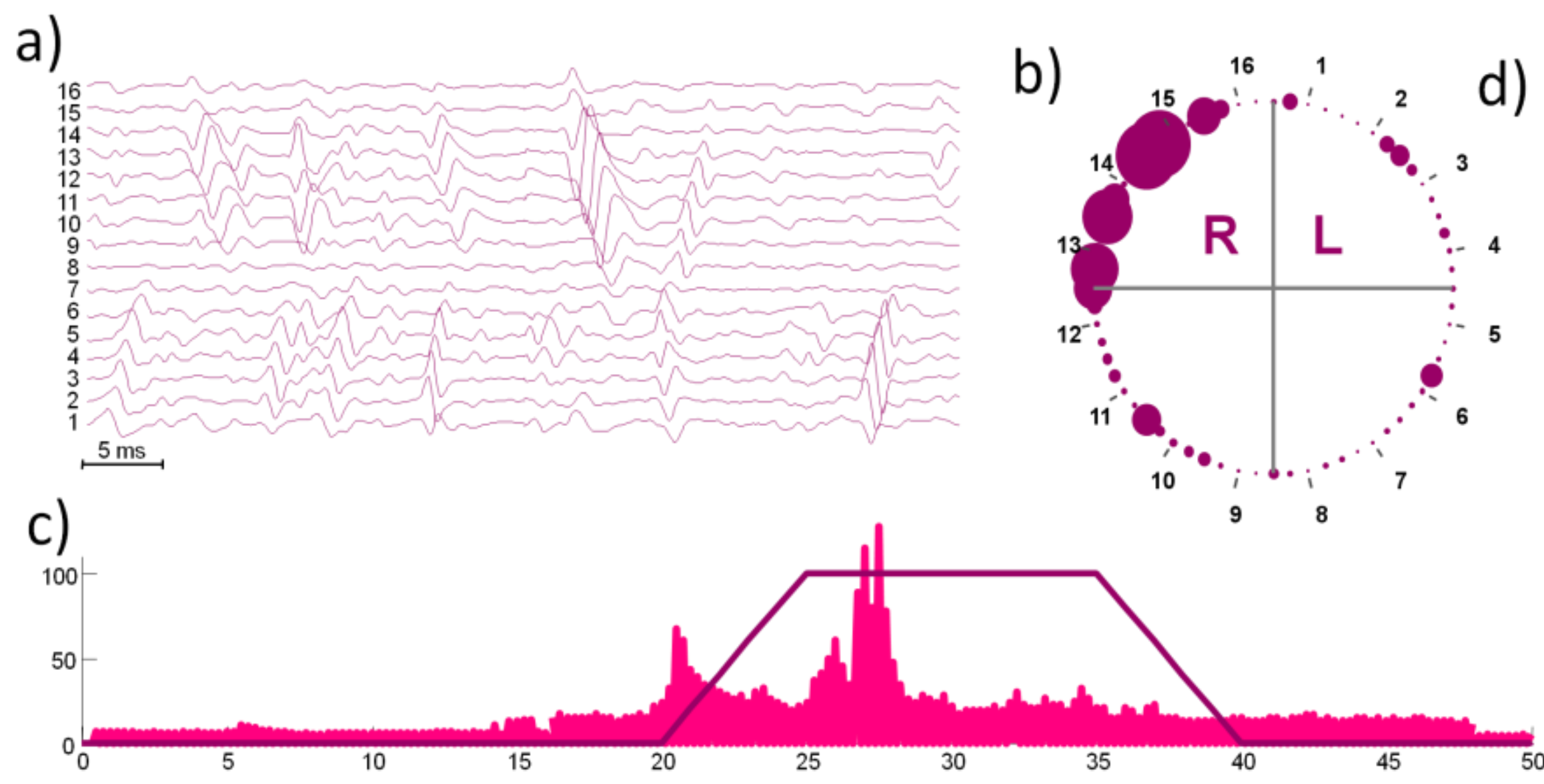


Figure 3. Example of output from one measurement. a) Multichannel EMG signals. b) Innervation zone distribution. c) Instantaneous EMG amplitude and theoretical squeeze force profile. d) endoanal US.

No significant changes in EMG amplitude were observed in women who had caesarean section or delivery with no damage. While a reduction of amplitude was observed in case of spontaneous lacerations or episiotomy. In particular in case of episiotomy, the women with innervation on the right side had a stronger reduction of EMG amplitude after delivery compared to the women with innervation on the left side, suggesting that choosing the right side of episiotomy could have limited the amplitude changes.

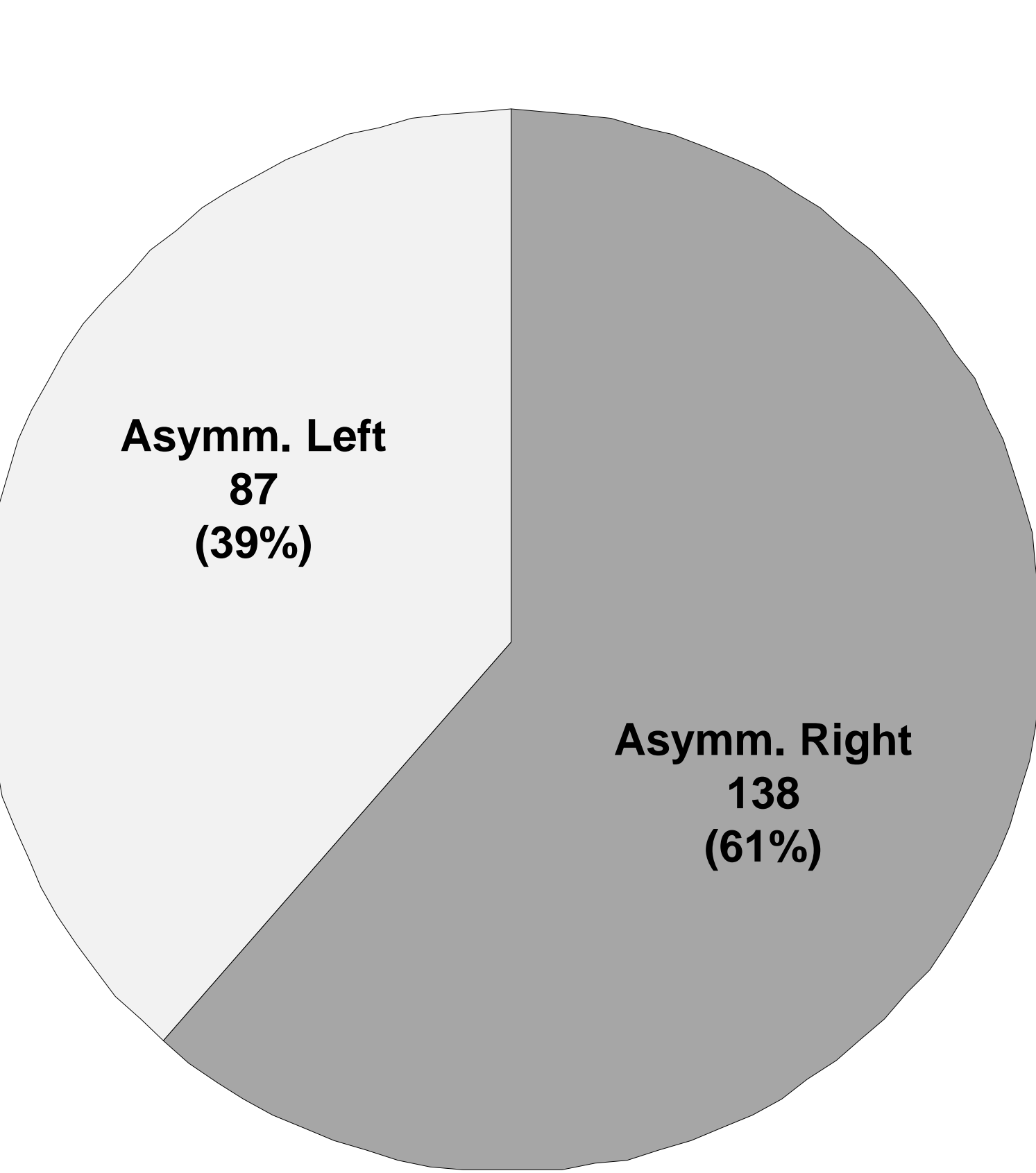
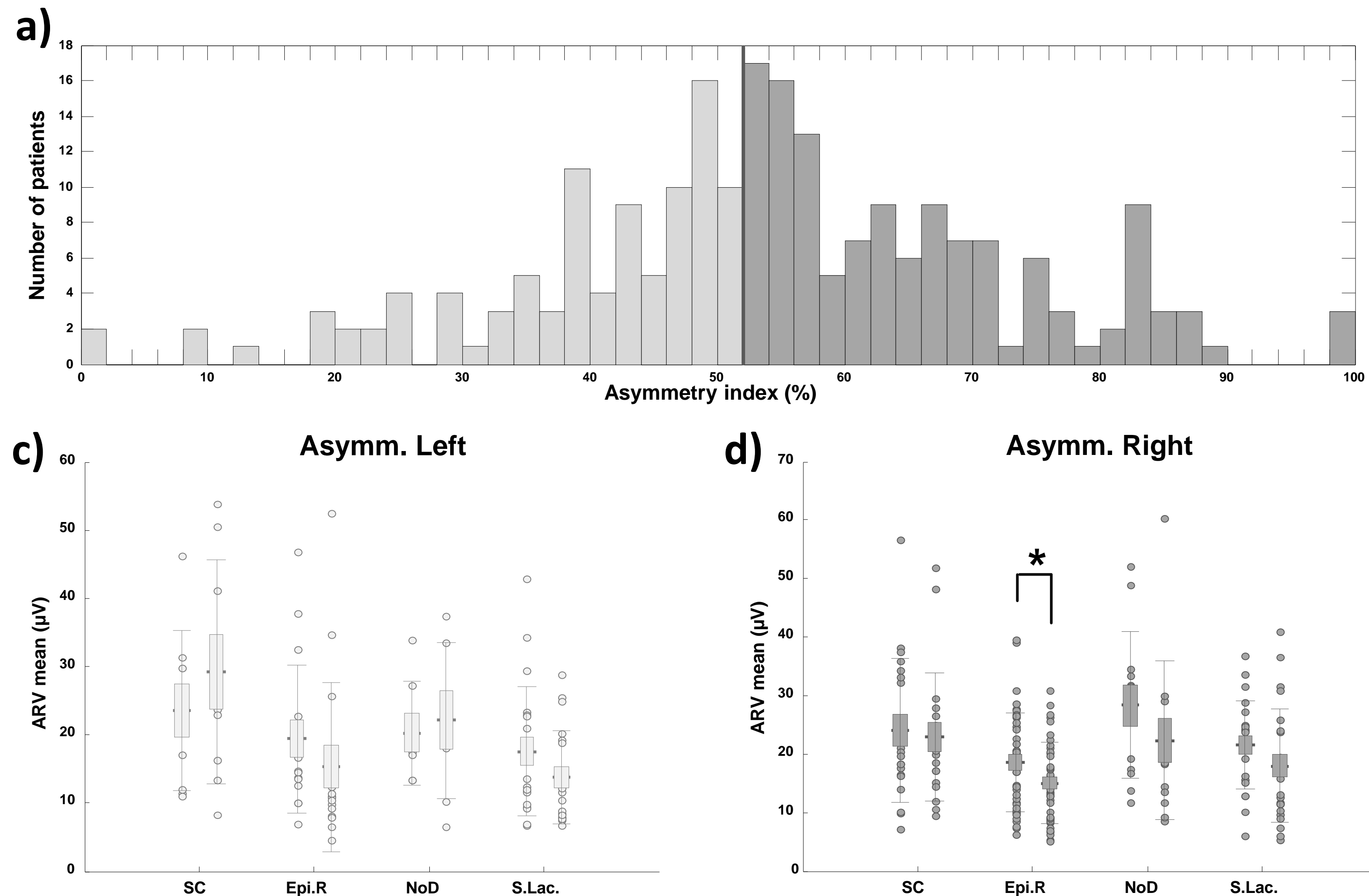


Figure 4. a) Distribution of IZ asymmetry index: 0%=left, 100%=right asymmetry. b) Distribution of women according to asymmetry index before delivery. c) and d) EMG amplitude (ARV) distribution according to the type of delivery.

## Conclusions

The episiotomy performed on the right side affected significantly the innervation of women with asymmetry on the right side. Superficial electromyography showed to be a promising method for detecting innervation zones before and after pelvic floor surgery, to avoid iatrogenic damage of pelvic floor innervation, and should be always performed before delivery in order to preserve innervation of the anal sphincter.

## References

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