

# The green light helps to make safe decisions before neurotomy or neurolysis.

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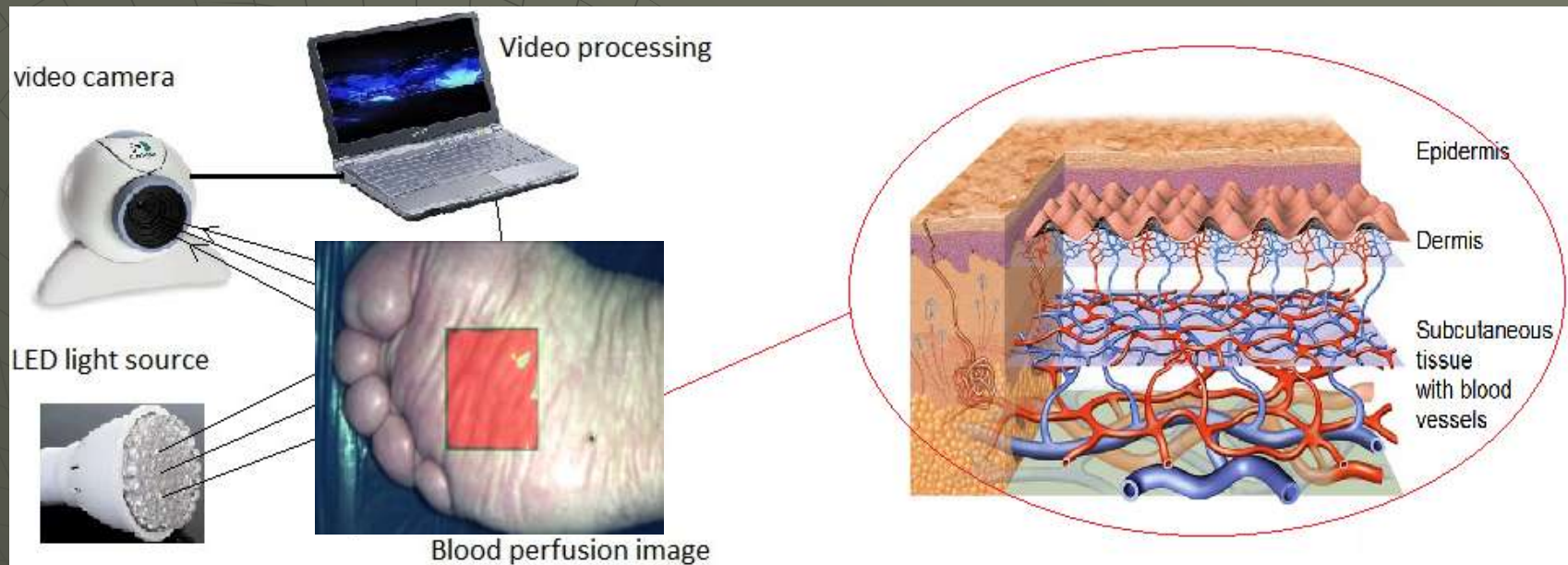


# Background and aims

- ◆ The **main aim** of our observational study was to find safe, contactless optical method for monitoring the quality of sympathetic block during the invasive treatment of neuropathic pain: a lumbar radiofrequency neurotomy or neurolysis by phenol injections.
- ◆ We believe that the amplitude of photoplethysmography signal has increased after previous injection of local anesthetic due to increasing of blood perfusion in patient skin blood vessels.
- ◆ For this reason the new non-contact optical photoplethysmography imaging technique was used for assessment of blood perfusion in human skin.

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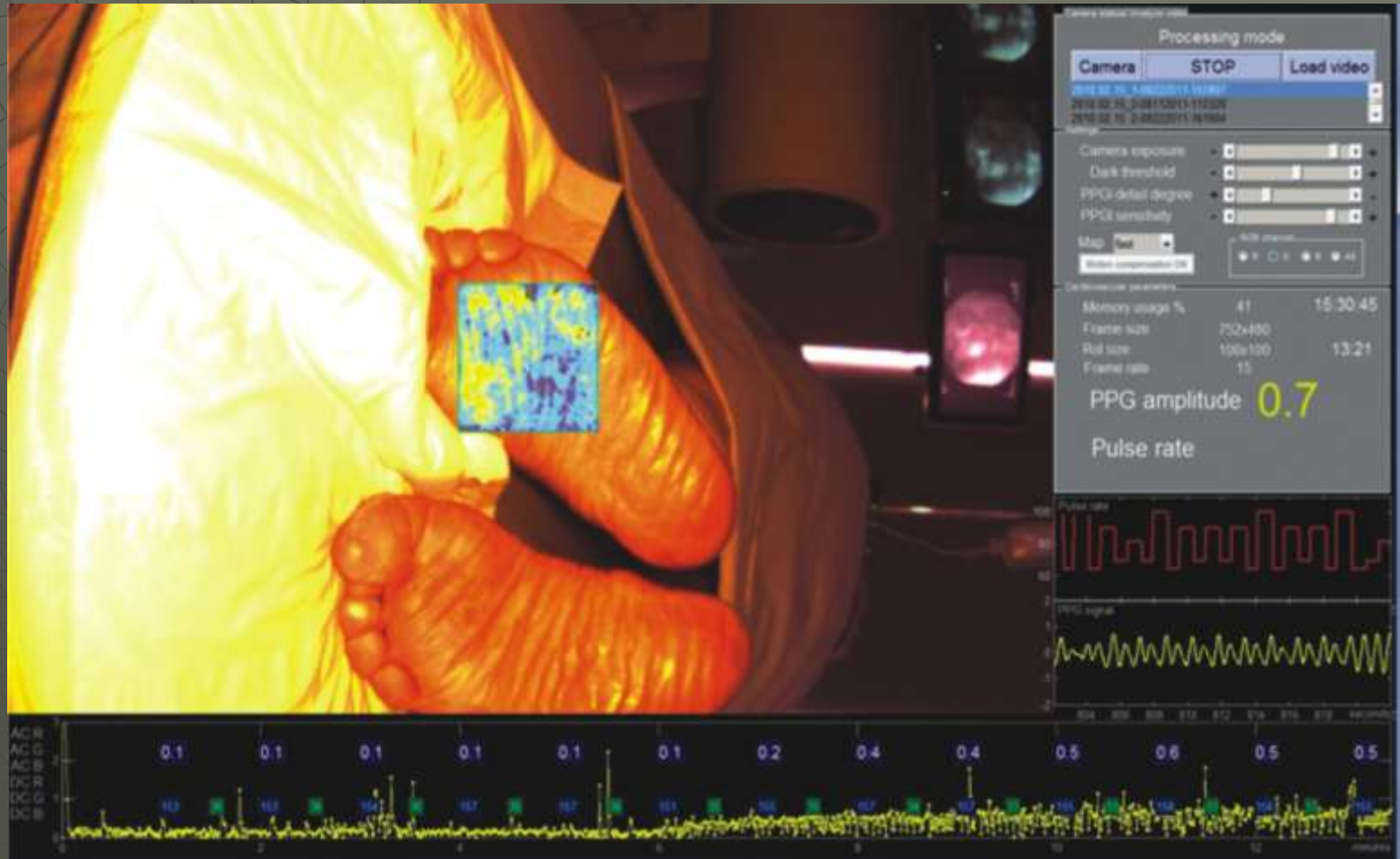
# The principle of photoplethysmography imaging



The **photoplethysmography imaging** (PPGI) device is developed for optical non-contact “online” monitoring of blood perfusion in human skin. The main principle of device is optical detecting of weak blood pulsations in human skin by visible light. Green channel of red-green-blue images was analyzed because it reflects light absorption in blood Hb and HbO<sub>2</sub>



# The screenshot of imaging photoplethysmography analysis software



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# Materials and methods

- ◆ The sympathetic block at L3 level under X-ray control in AP and LL view with a contrast was performed.
- ◆ The local anesthetic Lidocaine 100 mg/8 ml was injected.
- ◆ The PPGI uses green spectral band of backscattered radiation for amplitude detection of blood volume pulsations in skin upper layers. The data of modification amplitude of blood volume pulsations was analyzed “online”.
- ◆ After increasing of PPGI signal more than 2 times we consider the sympathetic block to be performed successfully.
- ◆ When the PPG amplitude increased and was outside of a region of  $\pm$  standard deviation of PPG evaluated in 1 minute interval it was detected that the sympathetic block has not occurred.



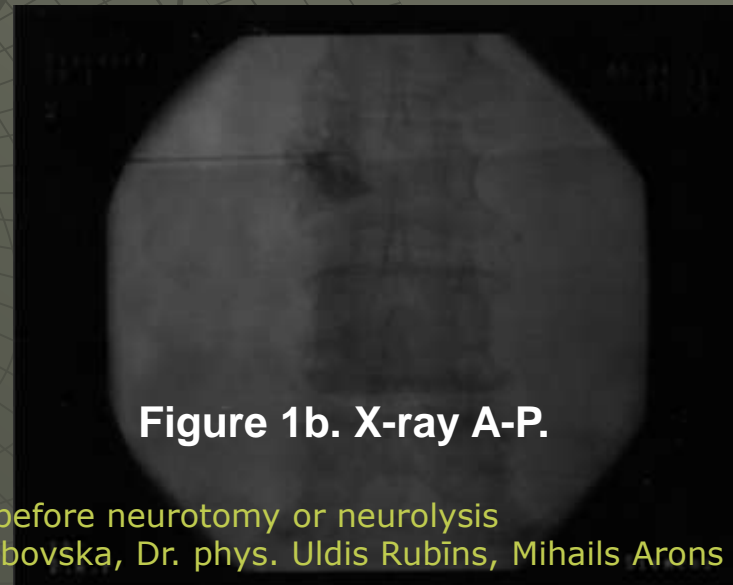
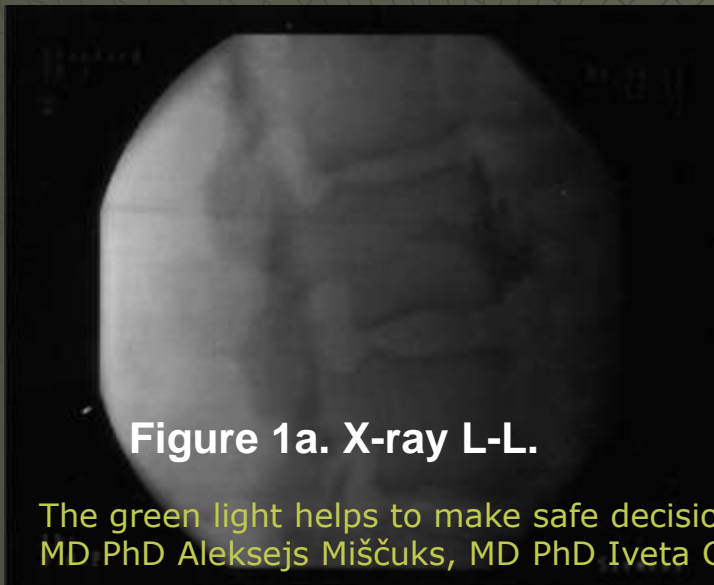
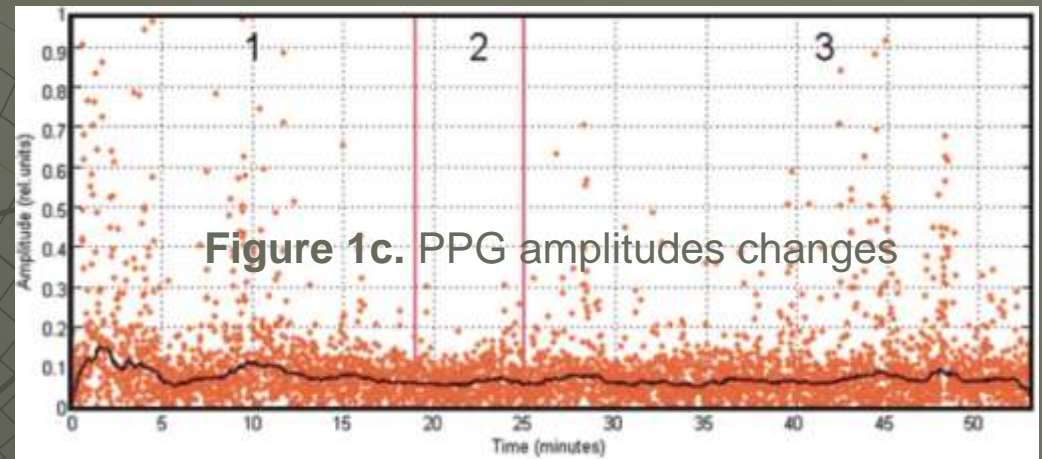
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# Results

- ◆ When the PPG amplitude increased and was outside of a region of  $\pm$  standard deviation of photoplethysmography signal evaluated in 1 minute interval it was detected that the sympathetic block has not occurred.
- ◆ In an experimental manner it was found that “online” PPGI was more efficient when performed in foot area.



The sympathetic block is present, but was not detected with imaging photoplethysmography, due to the “wrong” position of photoplethysmography signal measurement

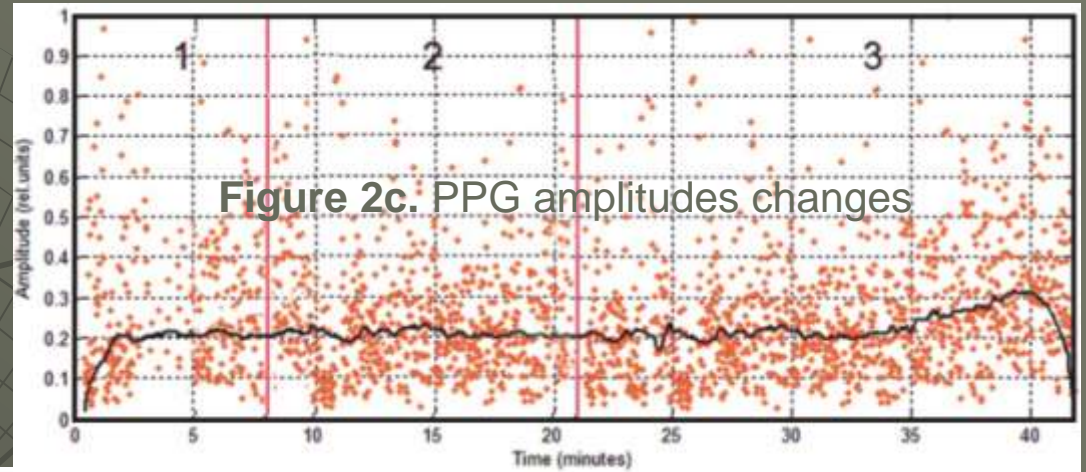


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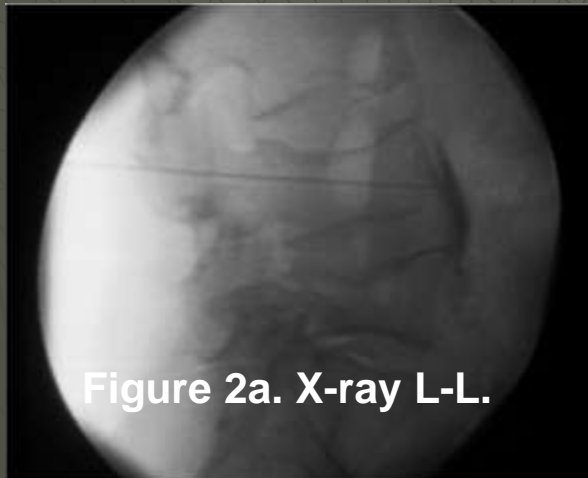
# Absence of the sympathetic block confirmed by imaging photoplethysmography



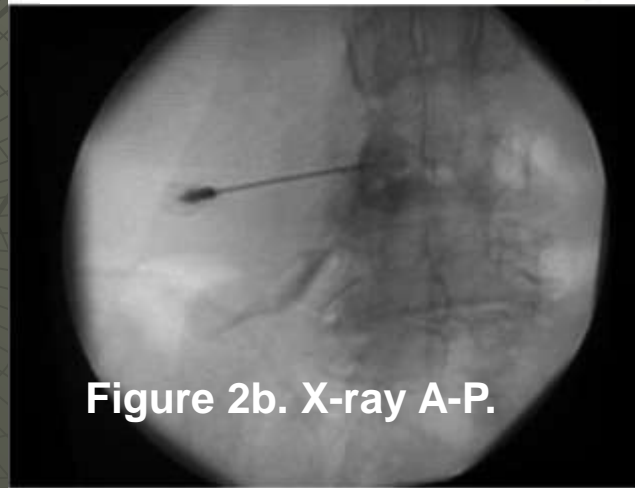
**Figure 2.** The screenshot of PPGI analysis software



**Figure 2c.** PPG amplitudes changes



**Figure 2a.** X-ray L-L.



**Figure 2b.** X-ray A-P.

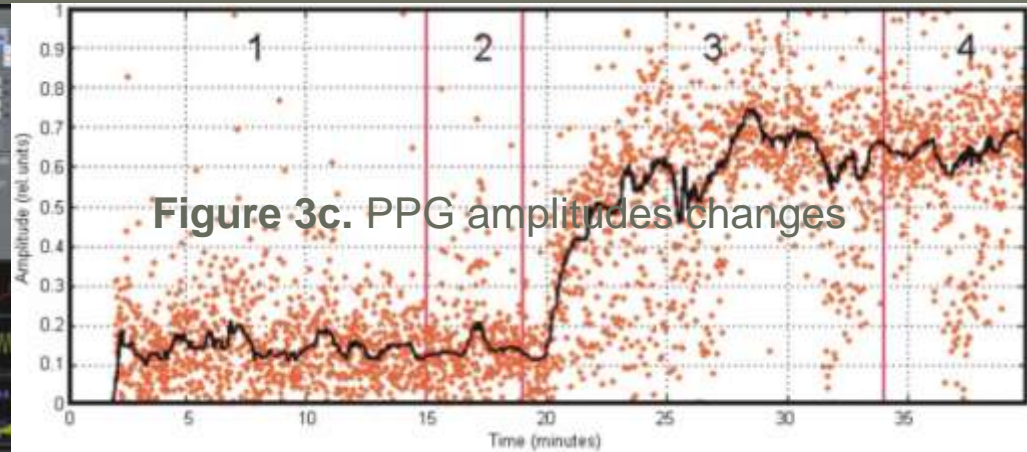
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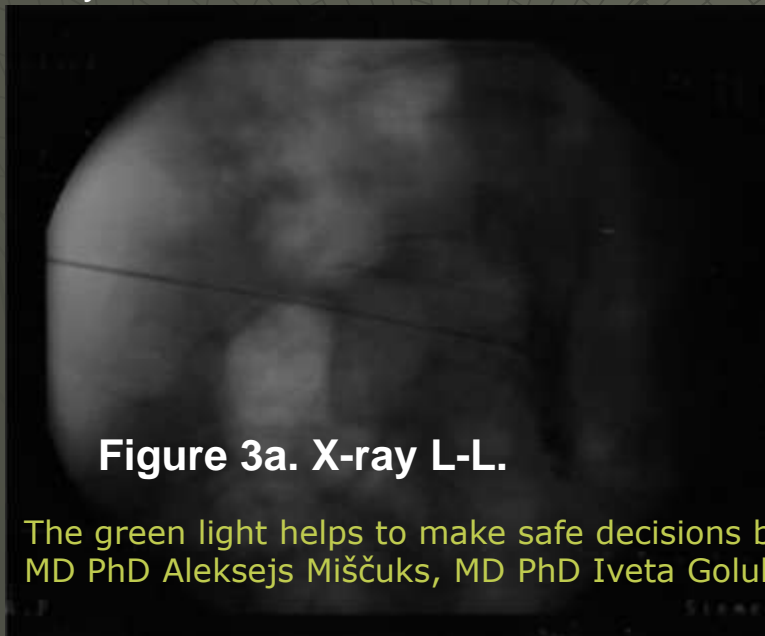
# The sympathetic block is present and confirmed by imaging photoplethysmography



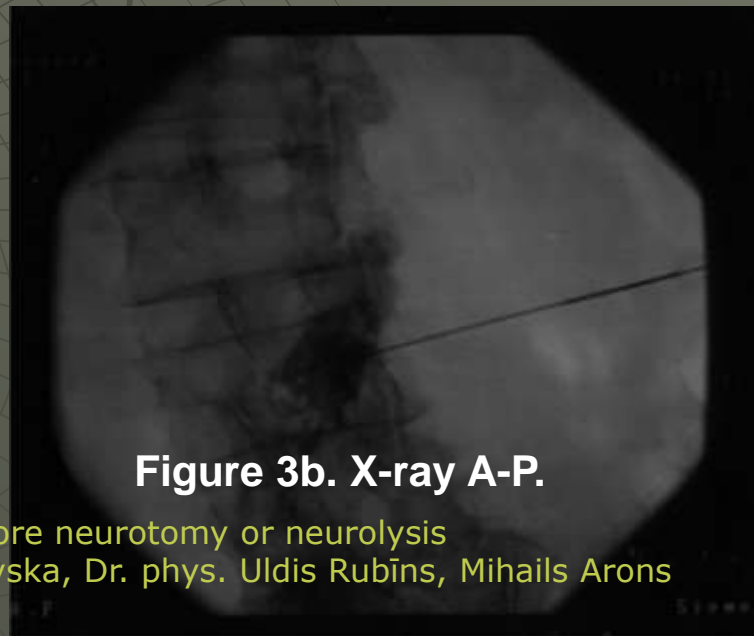
**Figure 3.** The screenshot of PPGI analysis software



**Figure 3c.** PPG amplitudes changes



**Figure 3a.** X-ray L-L.



**Figure 3b.** X-ray A-P.

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# Conclusion

The imaging photoplethysmography is new “online”, contactless, radiation free method which may be additionally used for confirmation of sympathetic blocks.

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