



**XXII.** kongres České společnosti anesteziologie,  
resuscitace a intenzivní medicíny

24.–26. 9. 2015

Parkhotel Congress Center Plzeň



Česká společnost anesteziologie,  
resuscitace a intenzivní medicíny

# Optimizing the administration of analgesic agents using ANI

## A next step towards personalized anesthesia



Hôpitaux de Lyon

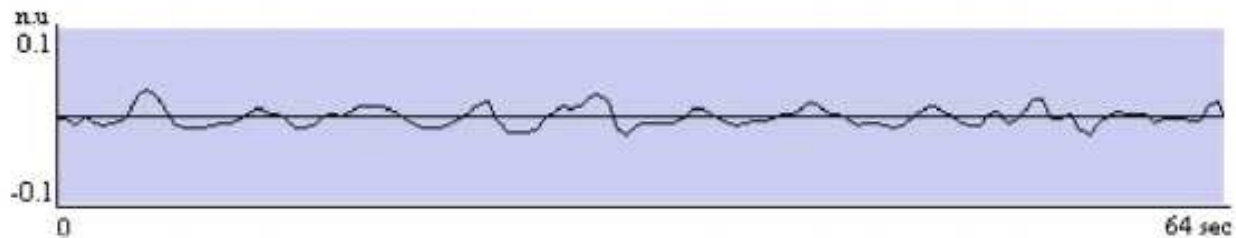
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Édouard Herriot hospital  
University of Lyon  
Lyon, France



# Heart rate variability

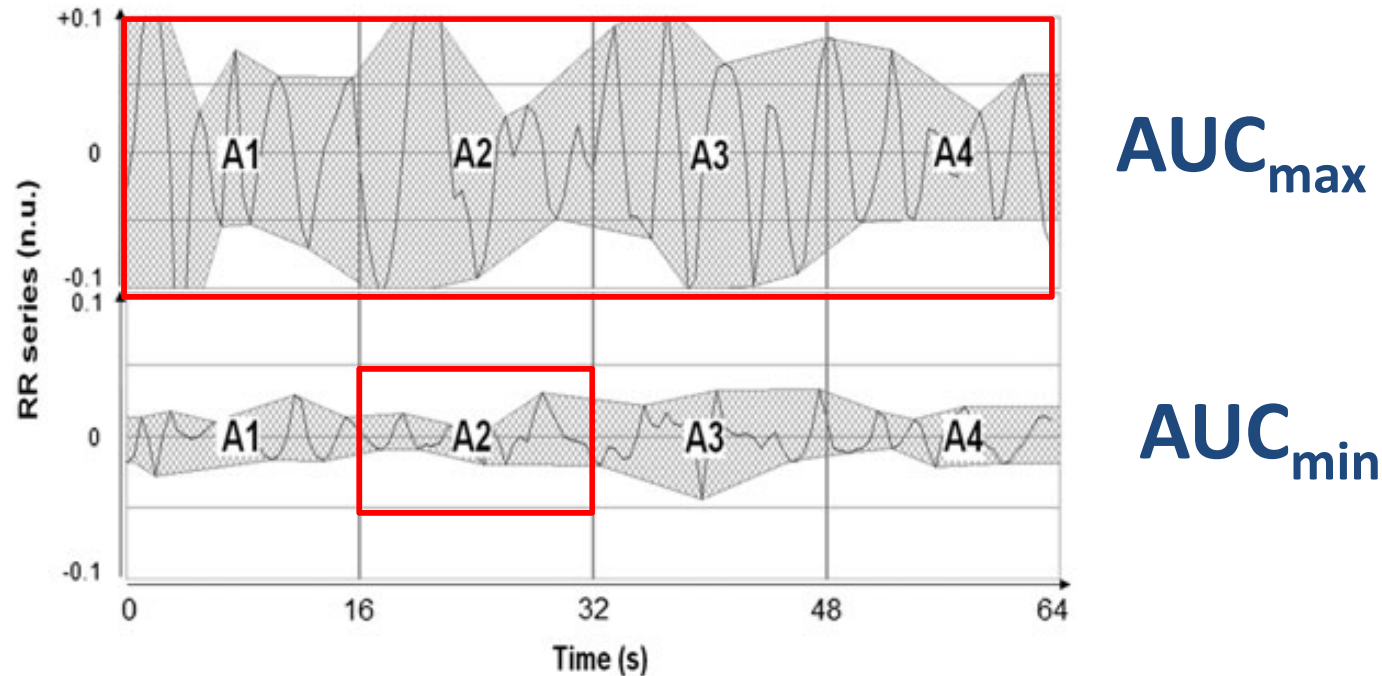
- Respiratory sinus arrhythmia
- Influence of respiration on RR series
- Reflects analgesia/nociception balance

**Great HRV = prominent parasympathetic tone = analgesia**



**Reduced HRV = prominent sympathetic tone = nociception**

# Principles of ANI calculation



$$ANI = 100 \times (\alpha \times AUC_{min} + \beta) / AUC_{max}$$

0 = Maximum nociception (sympathetic)

100 = Maximum analgesia (parasympathetic)

# Assessment of postoperative pain using ANI

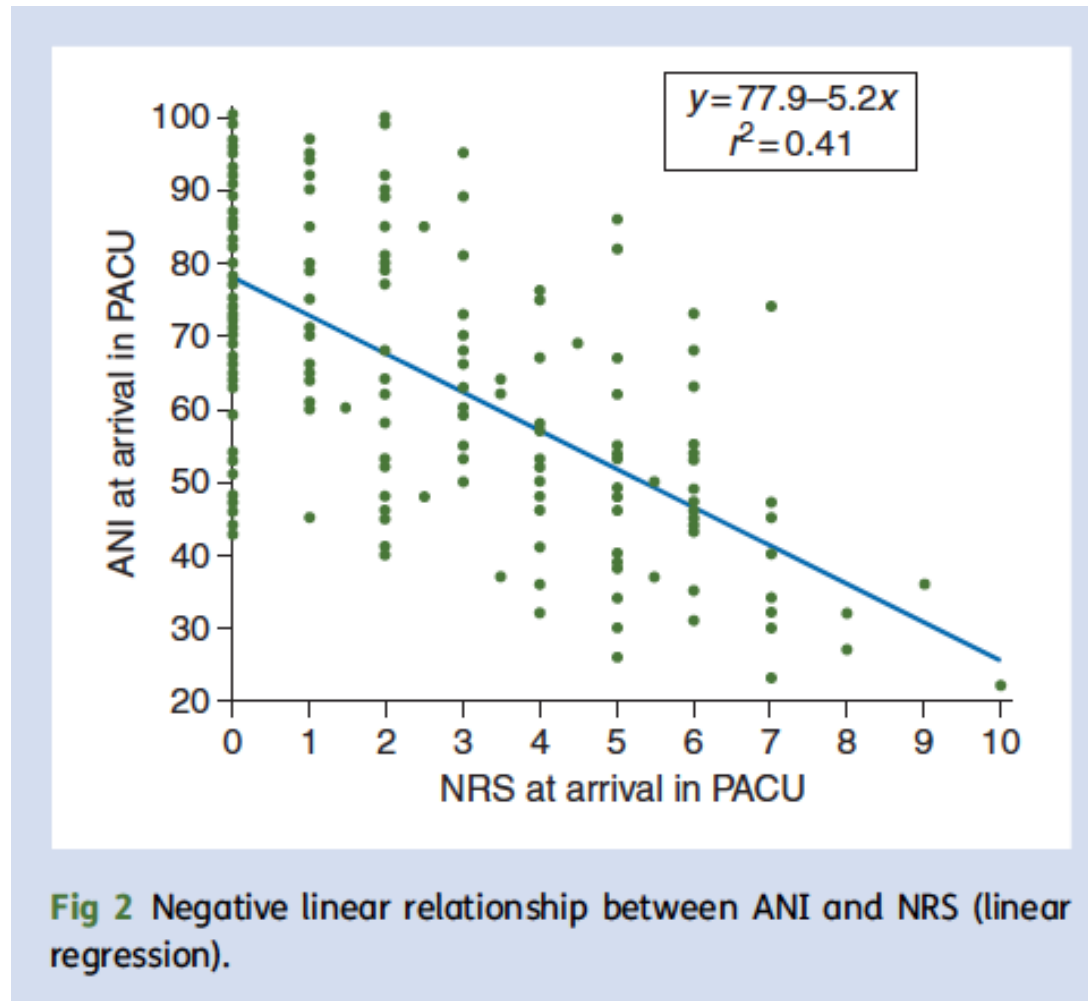
200 ASA I-II patients

General anesthesia

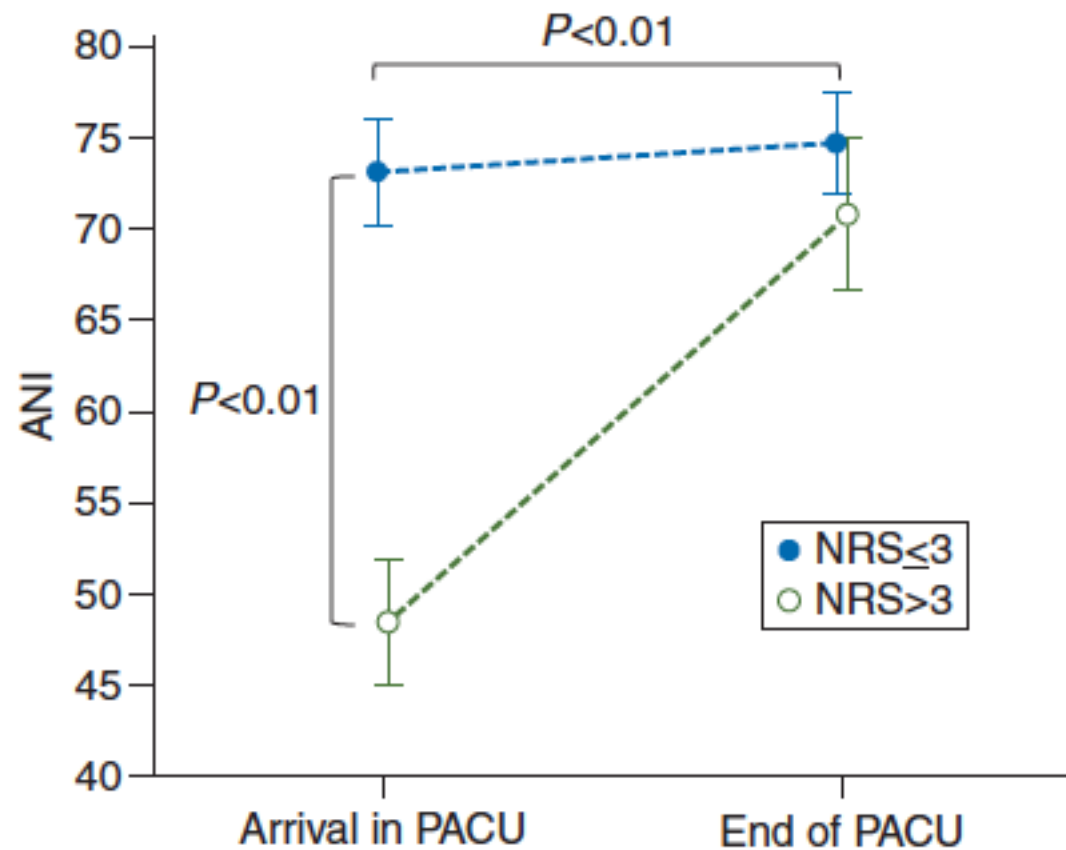
- halogenated / remifentanil (ENT or plastic surgery)
- propofol / remifentanil (ENT endoscopy)

ANI and NRS at arrival and end of PACU

# Assessment of postoperative pain using ANI



# Assessment of postoperative pain using ANI



# Prediction of immediate postoperative pain using ANI

200 ASA I-III patients

ENT or orthopedic lower limb surgery

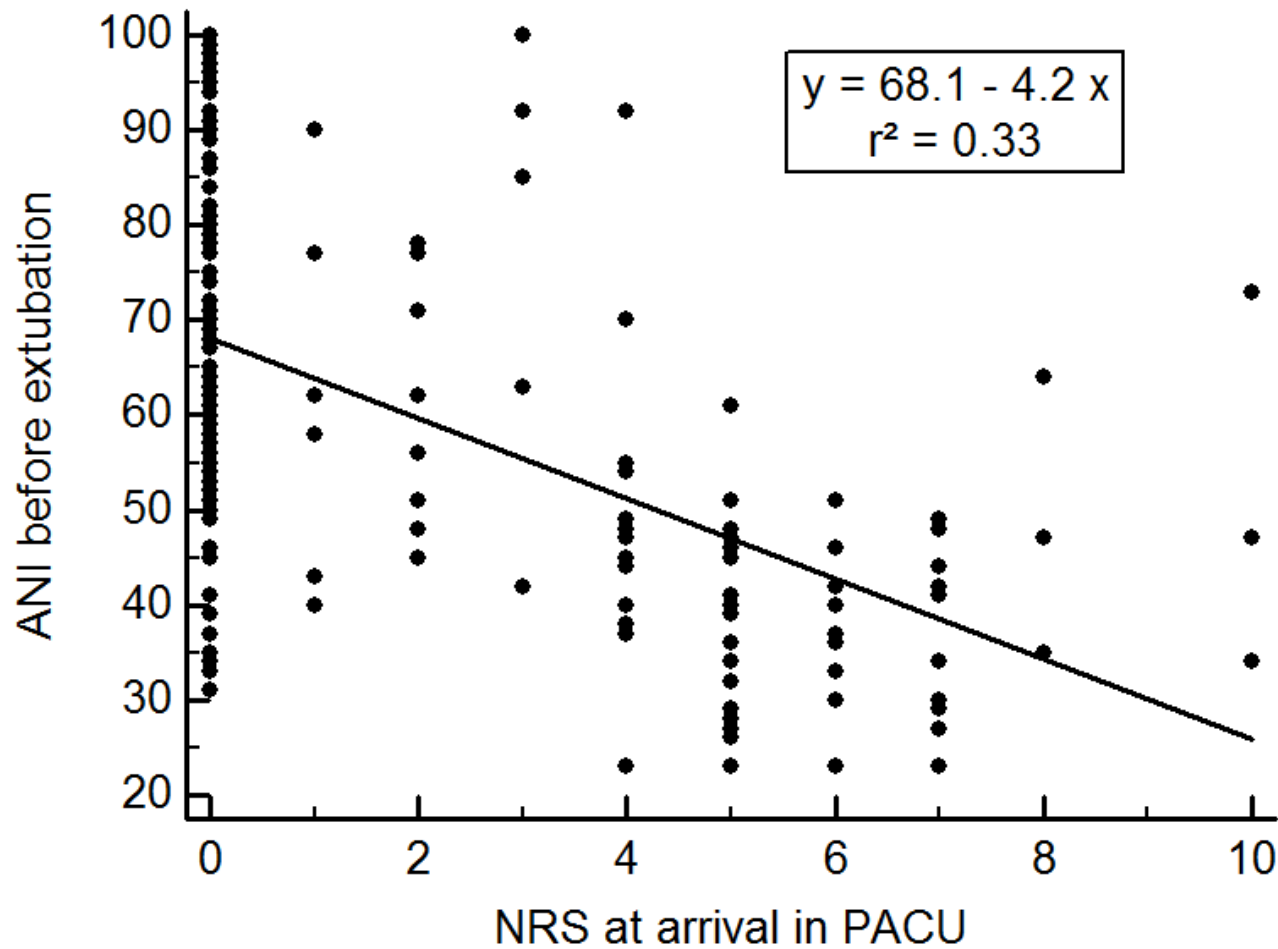
General anesthesia:

- Desflurane
- Remifentanyl
- ± cisatracurium

ANI immediately before extubation

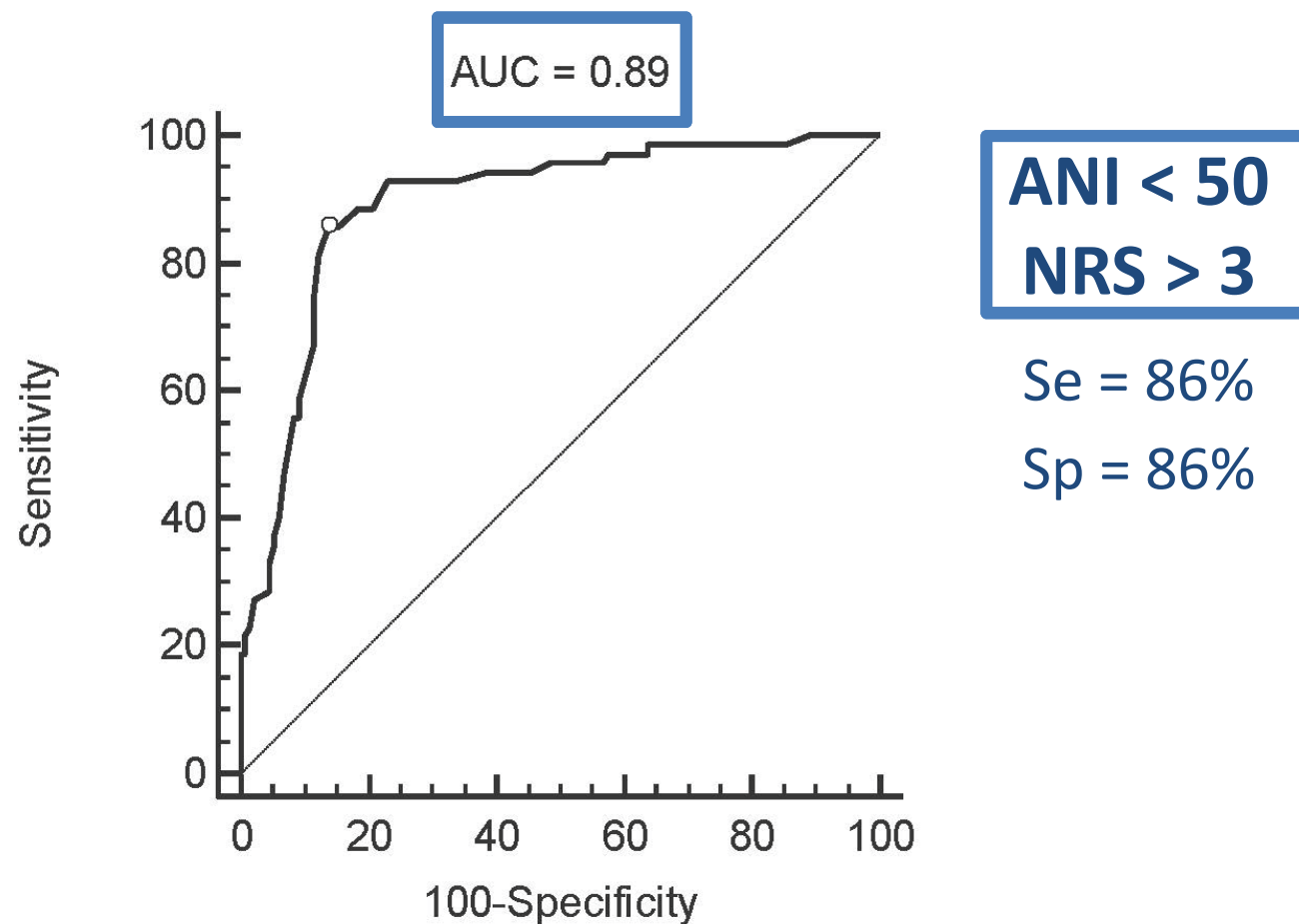
Pain score (NRS) at arrival in PACU

# Prediction of immediate postoperative pain using ANI





# Prediction of immediate postoperative pain using ANI



# Variations of ANI during abdominal laparoscopic surgery

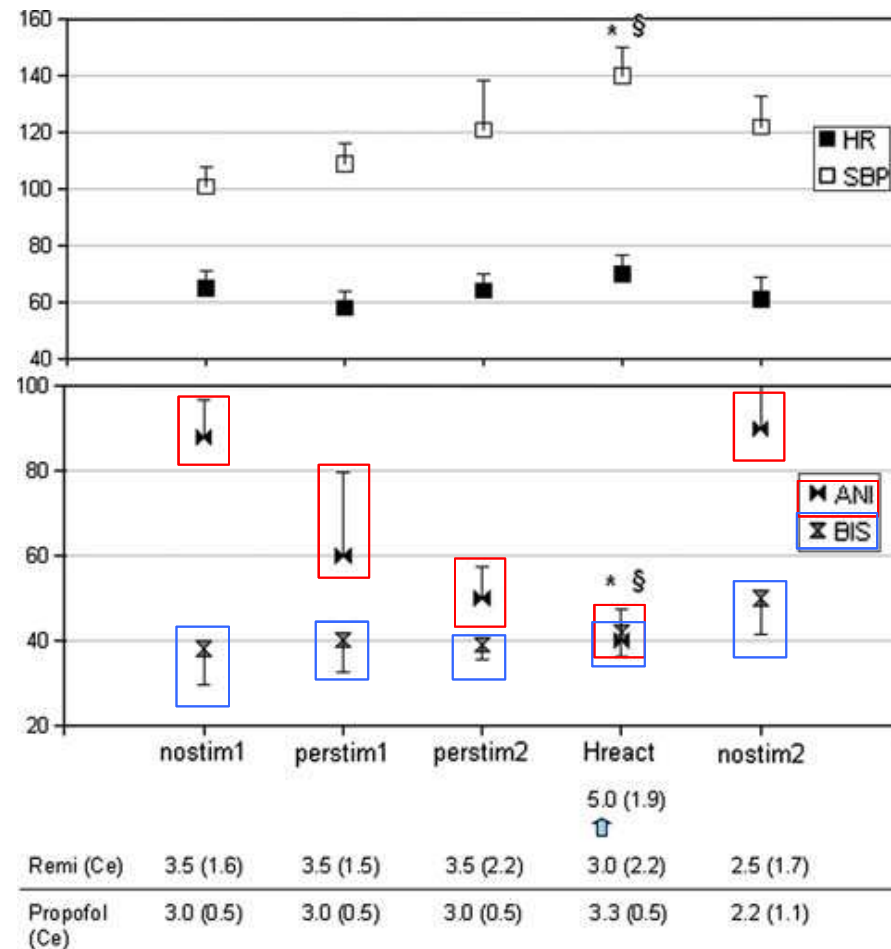
15 adult patients

Appendectomy or cholecystectomy

TIVA

- propofol (BIS 40-60)
- remifentanil
- cisatracurium

# Variations of ANI during abdominal laparoscopic surgery



# Analgesia monitoring in anesthetized children

12 children ( $8 \pm 5$  yrs)

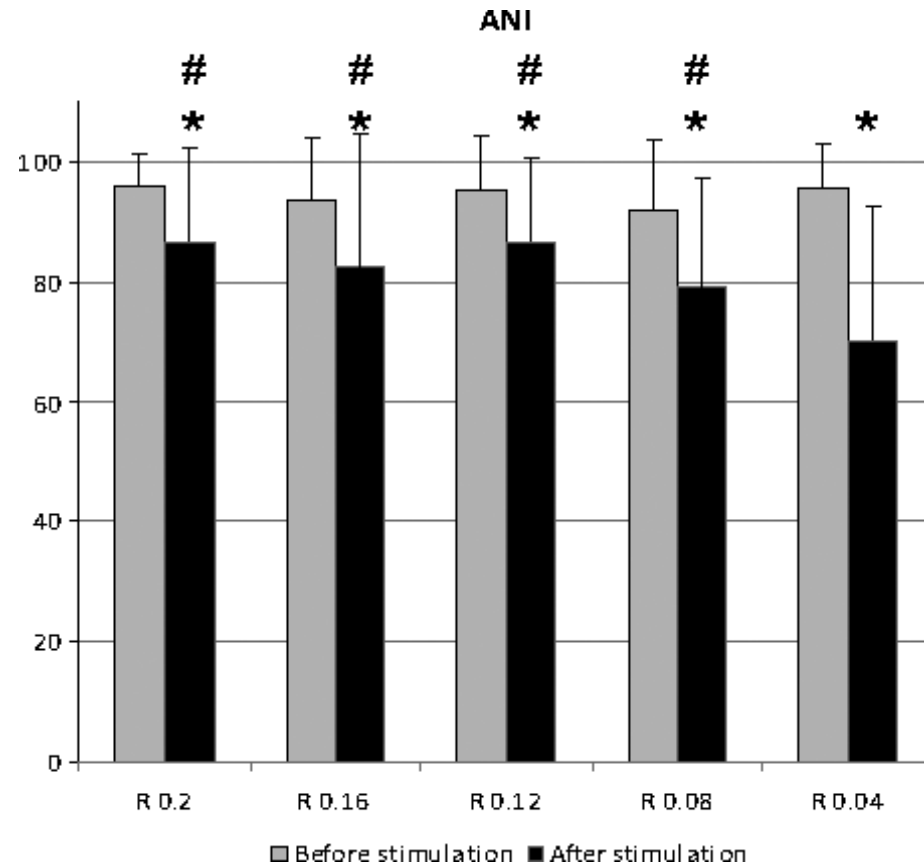
Middle-ear surgery

Desflurane (BIS  $50 \pm 5$ )

Remifentanil varying doses

Tetanic ulnar stimulation (5 mA, 50 Hz, 5 s)

# Analgesia monitoring in anesthetized children



\*P < 0.05 versus pre-stimulation value

#P < 0.05 versus R 0.04 post-stimulation value.

# Influence of nociceptive stimulation on ANI during TIVA

25 ASA I-II patients (18-65 yrs)

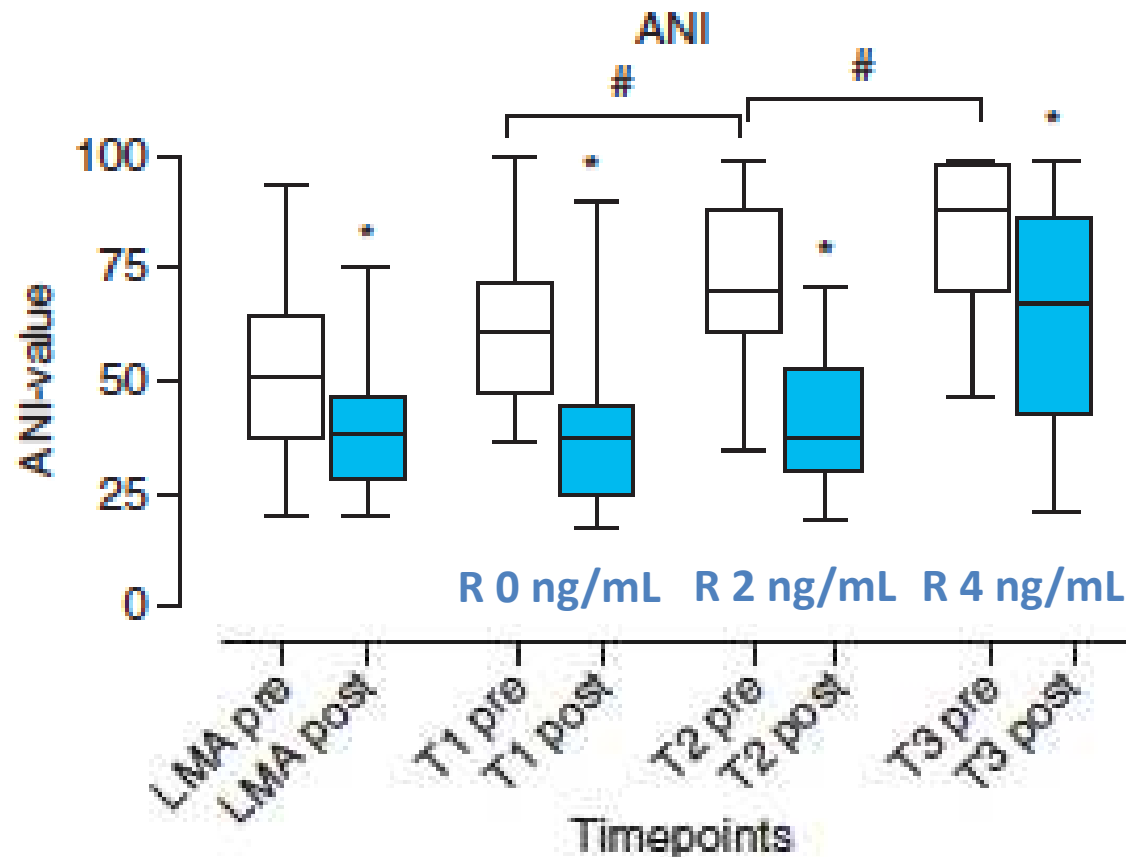
Elective surgery with laryngeal mask

TIVA:

- propofol (BIS 30-60)
- remifentanil varying doses

Tetanic ulnar stimulation (60 mA, 50 Hz, 30 s)

# Influence of nociceptive stimulation on ANI during propofol-remifentaniil anesthesia



\*P<0.05 vs. prestimulation value

#P<0.05 vs. lower remifentaniil concentration

# Prediction of hemodynamic reactivity during ENT endoscopy

50 ASA I-III patients

Suspension laryngoscopy with TIVA:

- Propofol (BIS 40-60)
- Remifentanil 2-4 ng/mL

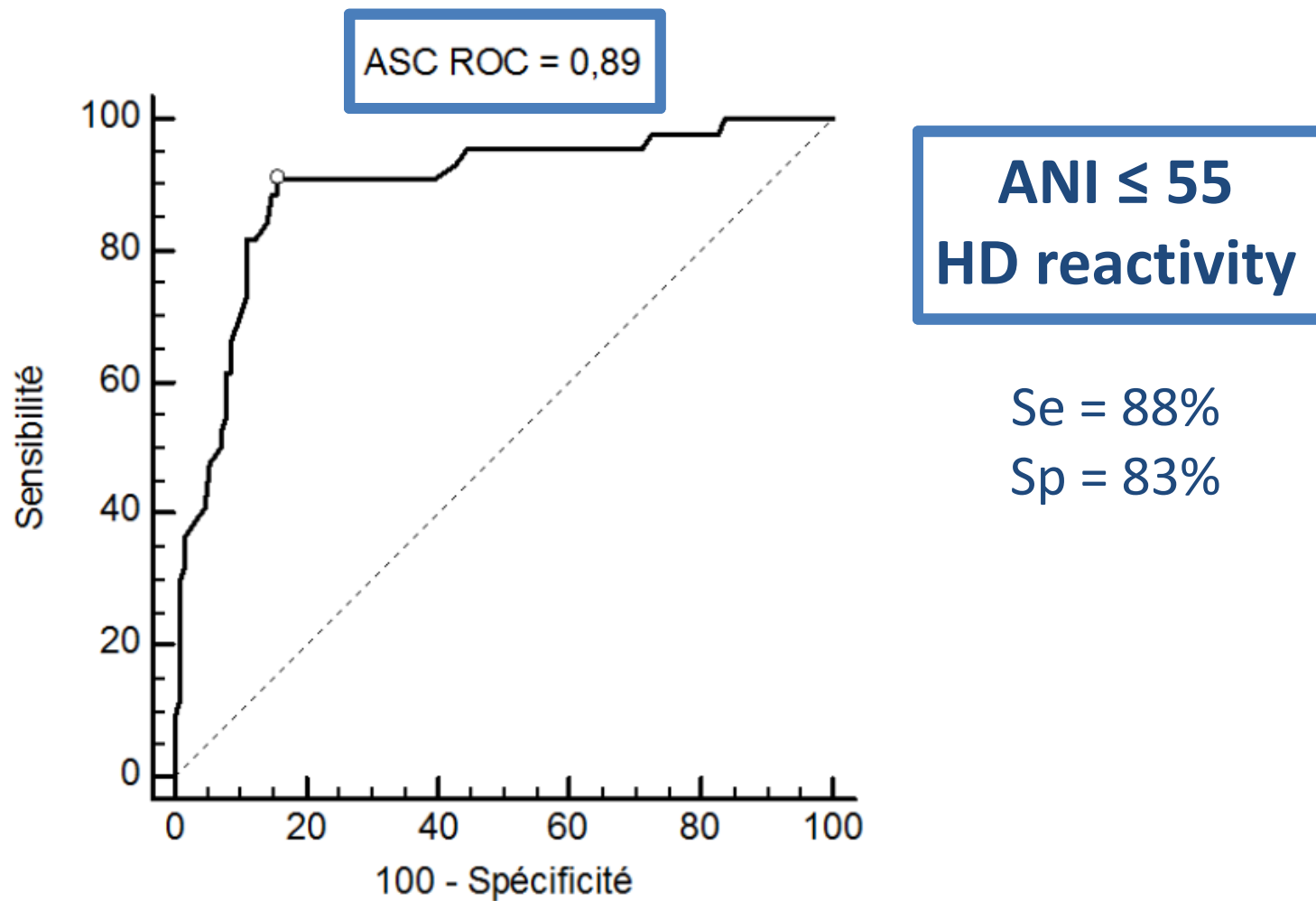
ANI measured:

- T0 = before procedure
- T1 = 1 min after beginning
- T2 = during procedure
- T3 = at eye opening

Hemodynamic reactivity: ↗ 20% HR or SBP



# Prediction of hemodynamic reactivity during ENT endoscopy



# Prediction of hemodynamic reactivity during desflurane/remifentanil anesthesia

128 ASA I-III patients

ENT or orthopedic lower limb surgery

General anesthesia:

- Desflurane
- Remifentanil
- $\pm$  cisatracurium

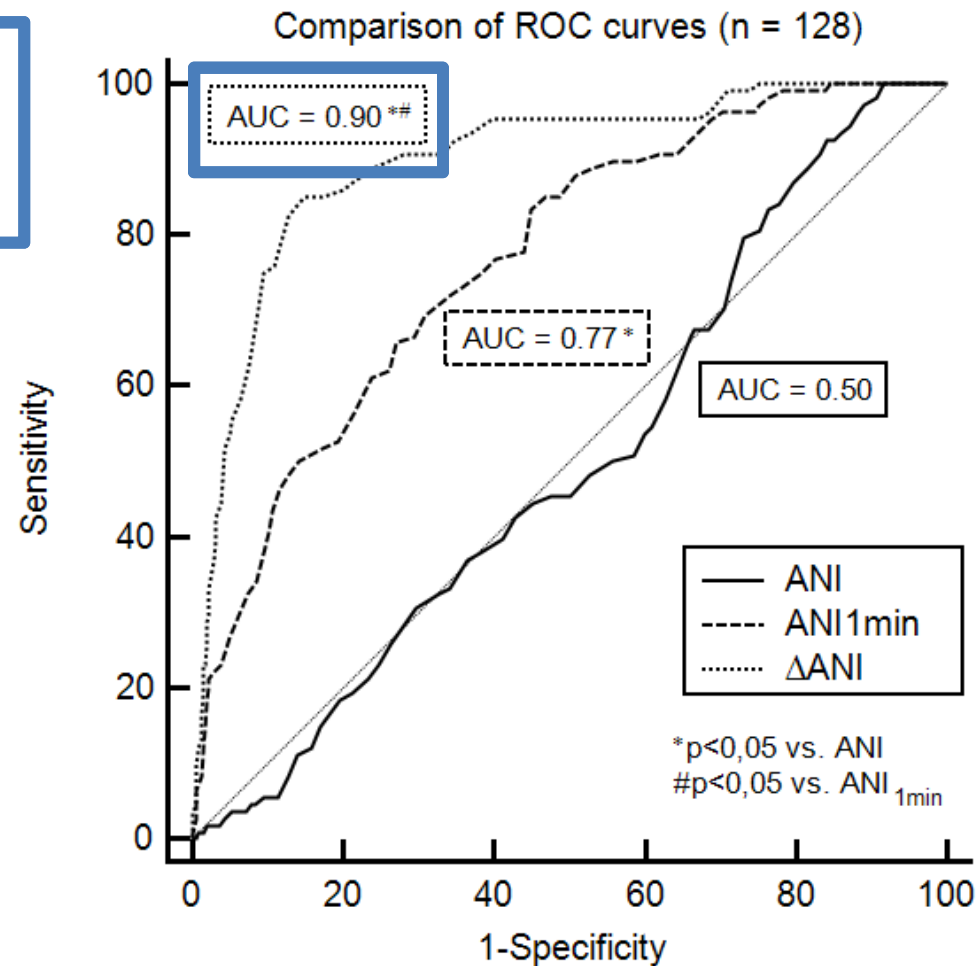
ANI, ANI<sub>1min</sub> and  $\Delta$ ANI at T0, T1, T2, T3

# Prediction of hemodynamic reactivity during desflurane/remifentanil anesthesia

**$\Delta$ ANI  $\leq$ -19%**  
**HD reactivity**

Se = 85%

Sp = 85%



# Next step: remifentanil automated administration?



# Conclusion

**ANI :**

- **continuous measurement of NAB**
- **personalized analgesia (remifentanil)**

**ANI > 55-60** useful to **optimize**

- **intraoperative analgesia**
- **postoperative pain management**

# Questions?

- Lets meet in: “Místo setkání”
- At 11:05 till 12:05