X. Conference

of functional examinations of the lungs

SNIP

for assessment of inspiratory muscle strength

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Sniff Nasal Inspiratory Pressure SNIP

Maximal sniff nasal inspiratory pressure (SNIP) is a sensitive test to early disclose respiratory muscle decline.

Sniff Nasal Inspiratory Pressure

Method

Placement

The **Sniff Nasal Inspiratory Pressure (SNIP)** is an alternative measurement to the classic volitional static test of inspiratory muscle strength, which is **M**aximum **I**nspiratory **P**ressure (MIP / PImax).

A sniff manoeuver is more natural and easier to perform than static efforts for most subjects.

Careful quality check to drastically reduce over-diagnosis of muscle weakness!

Sniff Nasal Inspiratory Pressure

Physiology and limitations

During a vigorous sniff, the nasal valve of the patent's nostril collapses and the pressure beyond the collapsed segment closely reflects oesophageal pressure and therefore inspiratory muscle strength.

Limitations that lead to under-diagnosis

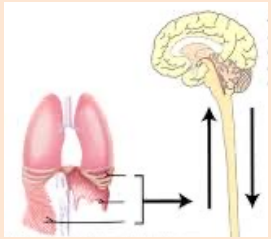
- Severe nasal congestion
  - Hinders pressure transmission
  - Leads to falsely low values
- Severe or acute airflow limitation
  - Underestimation of SNIP pressure in acute asthma (15%) or COPD (20%)

Indications for SNIP

ATS/ERS Statement to the diagnosis of the breathing pump

Breathing pump

- ⇨ Breathing centre
- ⇨ Conducting nerves
- ⇨ Thoracic wall and **inspiratory muscles**
- ⇨ Bony thorax



Fatigue or failure of inspiratory muscles stands for:

- ⇨ A potentially threatening condition
- ⇨ Imbalance between muscle load and capacity
- ⇨ In severe case – hypercapnic respiratory failure
- ⇨ Impaired cough and airway clearance
- ⇨ Risk for lung atelectasis and infection
- ⇨ Acute respiratory failure in neuromuscular disorders
- ⇨ Restrictive pattern in lung volumes or spirometry
- ⇨ Association to long-term mortality in cardiovascular disease or COPD
- ⇨ **See indications of MIP (PImax)**

ATS/ERS Statement on Respiratory Muscle Testing. Am J Respir Crit Care Med. Vol 166; 2002: 518-624

Sniff Nasal Inspiratory Pressure

Background and methodology

SNIP measurement - background

- Non-invasive test
- No need of a mouthpiece
- Natural and easy manoeuver
- During sniff
  - Strong activation of diaphragm and scalene muscles
  - Reliable assessment of diaphragm strength
- Often used as alternative to the MIP (PImax) measurement

SNIP is an accurate and non-invasive approximation of the oesophageal pressure swing during sniff manoeuvres.

Methodology

Measurement of **peak nasal pressure at one occluded nostril** during a **short maximal sniff** performed from relaxed end-inspiration (FRC) **through the contralateral nostril**.

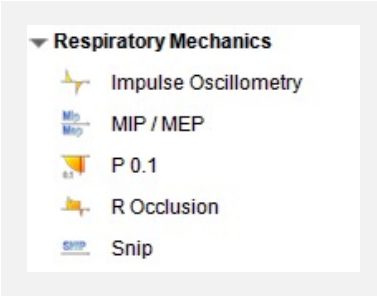
The mouth is closed.

Clinical application

Preparations and test procedure / instructions

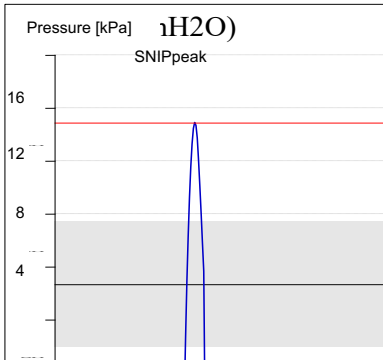
Preparations

- Patient in sitting position.
- One nostril occluded with a nasal plug connected to the pressure transducer via silicon tube.
- Contralateral nostril is open, mouth closed.



Test procedure

- After normal tidal breathing the subject performs a sharp and maximal sniff from end-expiratory level (FRC).
- Target parameter: **SNIPpeak**
- After 5-7 trials a plateau in **SNIPpeak** values should be visible.
- Up to **15 to 30 s pause** between trials.



SNIP target parameter	
SNIPpeak	Sniff nasal inspiratory peak pressure

SNIPavg and SNIPsus not recommended.

Reference values
Adults and children

Reference values

Children: Stefanutti (6-17) Adults: Uldry (20-80)

- ⇨ SNIP is similar in adults and children
- ⇨ Nearly age independent

- ⇨ SNIP in healthy subjects is often higher than MIP.
- ⇨ Limits of agreement between SNIP and MIP.
  - ⇨ SNIP and MIP are NOT interchangeable.
  - ⇨ Complementary information.

D.Stefanutti et al. Sniff Nasal Inspiratory Pressure. Am J Respir Crit Care Med 1999; 159: 107-111
C.Uldry et al. Maximal values of sniff nasal inspiratory pressure in healthy subjects. Thorax 1995; 50: 371-375

Quality check & clinical interpretation

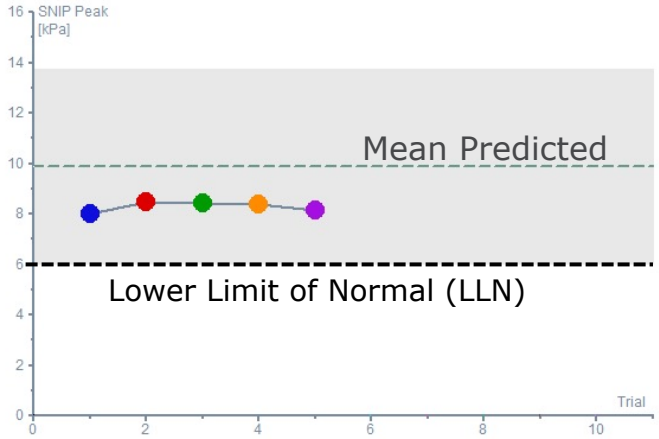
Parameter SNIPpeak

Quality check

- ⇨ Minimal 3 trials.
- ⇨ Plateau of SNIPpeak values.
- ⇨ SNIPpeak CV% < 10%.

Evaluation of dysfunction

- ⇨ Abnormal SNIPpeak < LLN
- ⇨ Z-score classification

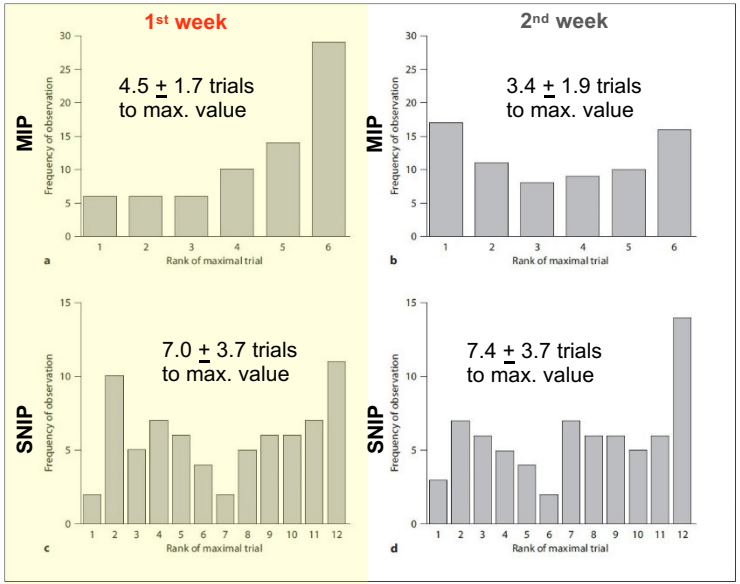


	Pre...	Pred	Best	%(Best/Pred)	Tr 1	Tr 2	Tr 3	Tr 4	Tr 5	Z-Score
SNIP Peak kPa	6.04	9.88	8.47	85.7	8.02	8.47	8.43	8.38	8.13	−3 −2 −1 1 2 3

Comparison of MIP and SNIP

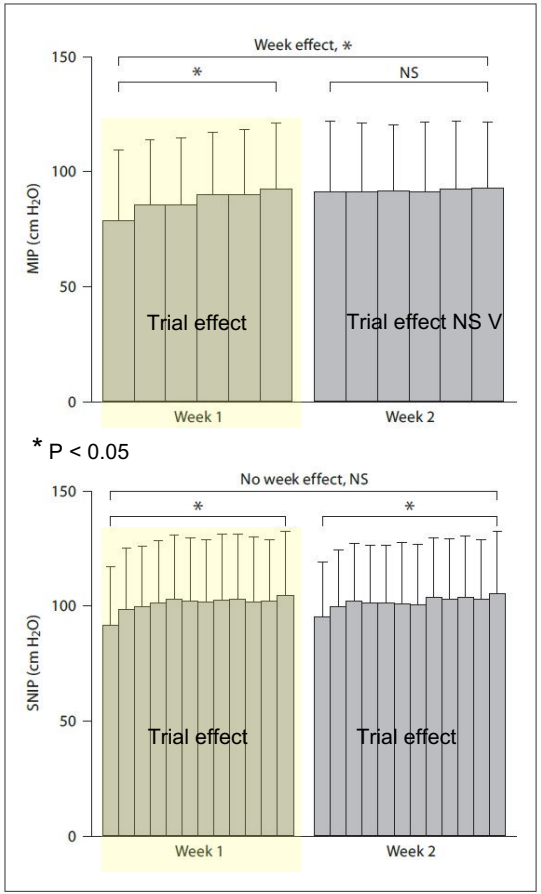
Learning effects and reproducibility

71 study subjects performed MIP and SNIP during
2 sessions one week apart.



Learning effect
p=0.0008 in MIP

Without week effect
p=0.54 in SNIP



Terzi N, et al. Mouth and Nasal Inspiratory Pressure: Learning Effect and Reproducibility in Healthy Adults. Respiration 210; 80:379-386

Conclusion

The classic “MIP” is difficult to perform for some subjects.

Sniff testing “SNIP” is based on a natural and easy manoeuvre and therefore more suited for most subjects.

SNIP target parameter	
SNIPpeak	Sniff nasal inspiratory peak pressure

Recommendation to perform multiple tests of respiratory muscle function (SNIP + MIP) in order to increase diagnostic precision.