



Copenhagen CSF Study Group

# The Relationship between Patient Height and Intracranial Pressure in Children and Adults

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# Introduction

- The management of increased **intracranial pressure (ICP)** and monitoring of ICP is an important part of neurosurgery.
- The same estimated reference values for ICP of 7-15 mmHg is used indiscriminately for children and adults.
- **The effect on ICP of a postural change** from a supine to an upright standing position has been established (Andresen et al.), though the association between height and ICP in upright position has not been studied.
- **The aim of this study** was to explore the relationship between ICP values and patient height.



# Methods

- 41 patients undergoing diagnostic ICP monitoring for a suspicion of hydrocephalus or idiopathic intracranial pressure (IIH) were prospectively included in this study.
- They were divided into **three age groups**:  
4 young children (age  $\leq 12$  years), 5 older children (age 13-17 years) and 32 adults (age  $> 18$  years).
- **ICP was measured** in parenchyma by either a cable-based or a telemetric probe.
- Measurements included both **a supine and an upright standing position**. Each position was maintained for 10 min until ICP had stabilized.



# Results I – Height and Body Positions

	<b>Age</b>	<b>N</b>	<b>Mean Height</b>	<b>Range Height</b>
Young children	7-12	4	137.3 cm	122-159
Older children	13-17	5	164.4 cm	147-180
Adults	23-85	32	169.4 cm	155-188

Height had no impact on measured ICP in either **supine** ( $p = 0.15$ ) or **upright standing** position ( $p = 0.28$ ).

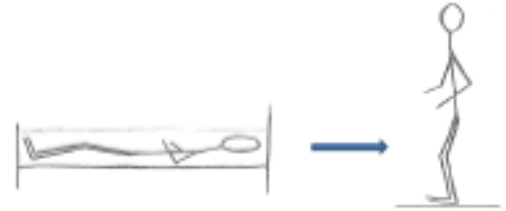
Because of the physiological - and body size differences, we believed the **individual change in ICP** to be a more useful tool than the calculated difference in absolute numbers for comparison of the postural effect on ICP between groups.



# Results II – Change in ICP

- In the entire group, changing body position from **supine to upright** caused a significant decrease in ICP:

median decrease 12.0 mmHg,  $p < 0.001$



- Decrease in ICP for each group:

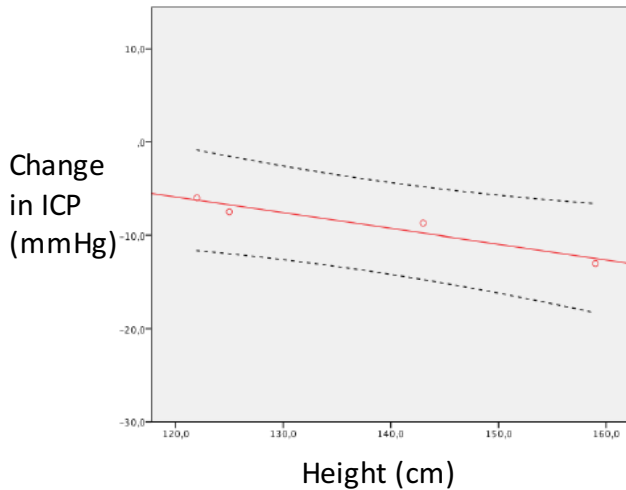
	N	Median decrease in ICP
Young children ( $\leq 12$ years)	4	8.1 mmHg, $p = 0.068$
Older children (13-17 years)	5	10.0 mmHg, $p = 0.043$
Adults ( $> 18$ years)	32	12.5 mmHg, $p < 0.001$



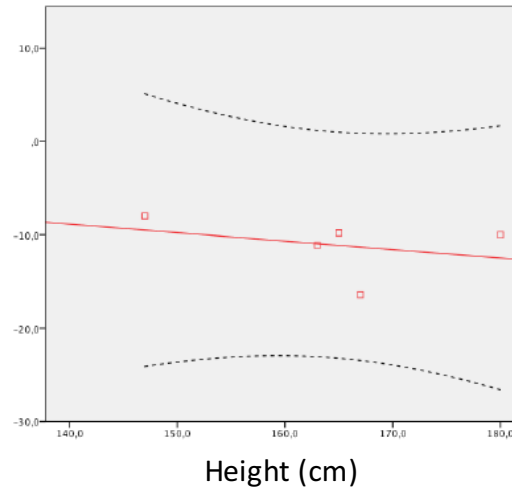
# Results III – Height and Change in ICP

The **change in ICP** was correlated to **height** in younger children ( $p = 0.019$ ), but not in older children ( $p = 0.29$ ) or adults ( $p = 0.34$ ).

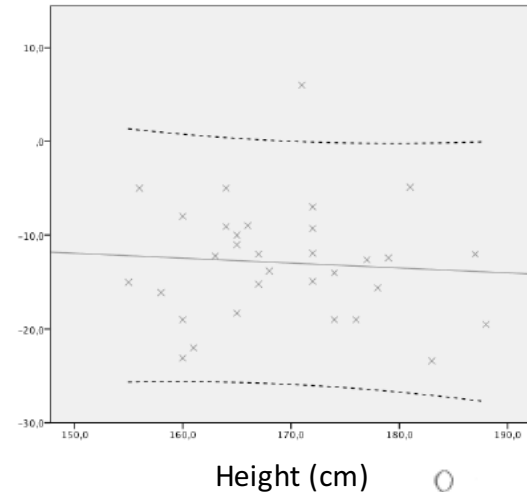
Young children ( $\leq 12$  years)



Older children (13-17 years)



Adults ( $>18$  years)



# Conclusion

- We did not establish a direct correlation between ICP and height.
- In younger children we found a relationship between height and ICP decrease going from a supine to upright position.
- A similar correlation was not found in older children or adults.
- Our results may be important for approaches to physiological risks of overdrainage caused by shunting.

