Differences between conventional laryngoscopy, video laryngoscopy and flexible fibre optics with regard to the change in dural sac width on an unfixed cadaver model with unstable cervical spine injury

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Background: Airway management in the case of patients with an **unstable cervical spine** requires a cautious approach if secondary damage is to be prevented, but the question regarding the **optimum method** still remains unresolved. The aim of our study was to investigate whether intubation through **conventional laryngoscopy**, by using a **video laryngoscope** and by means of a portable, **flexible fibre bronchoscope** varied with regards to **dural sac compression** on an **unfixed human cadaver model** with two different unstable injuries of the upper cervical spine.

Material and Methods: A positive ethics vote was obtained. Orotracheal intubation by **conventional direct laryngoscopy** (DL; Fig. 1), by using the **Ambu KingVision video laryngoscope (VL)** and by using a **flexible Ambu aScope 3 disposable endoscope (FO)** system were performed in 6 fresh human cadavers. The dural sac was filled with contrast dye prior to intubation to allow continuous **myelography** by lateral fluroscopy. **Compression of the dural sac** at the **C0/C1** and the **C1/C2** (Fig. 2) level as well as secondary parameters were assessed in the **intact spine** as well as in presence of **isolated atlanto-occipital dislocation (AOD)** and of **combined atlanto-occipital dislocation and atlanto-axial instability (AOD and AAI).** Intubation methods were considered independent and examined according to Mann-Whitney. P-values < 0.05 were considered significant.

Results: At the **C0/C1** level **videolaryngoscopy** resulted in **less compression** of the dural sac than **direct laryngoscopy** in isolated **AOD** (DL 1.21±0.53mm, VL 0.74±0.33mm, FO 0.43±0.26mm), as well as in combined **AOD and AAI** (DL 1.18±0.45mm, VL 0.80±0.29mm, FO 0.52±0.28mm). **Fiberoptic intubation** showed **less compression** of the dural sac than **direct** and **videolaryngoscopy** in both injury models (Fig. 3).

At the **C1/C2** level, **fibreoptic intubation** showed **less compression** than **direct** and **videolaryngoscopy** in isolated **AOD** (DL 0.20±0.20mm, VL 0.27±0.17mm, FO 0.07±0.16mm) and **less compression** than **videolaryngoscopy** in combined **AOD and AAI** (DL 0.44±0.36mm, VL 0.41±0.23mm, FO 0.25±0.14mm). There was **no difference** between **direct** and **videolaryngoscopy** at this level (Fig. 4) .

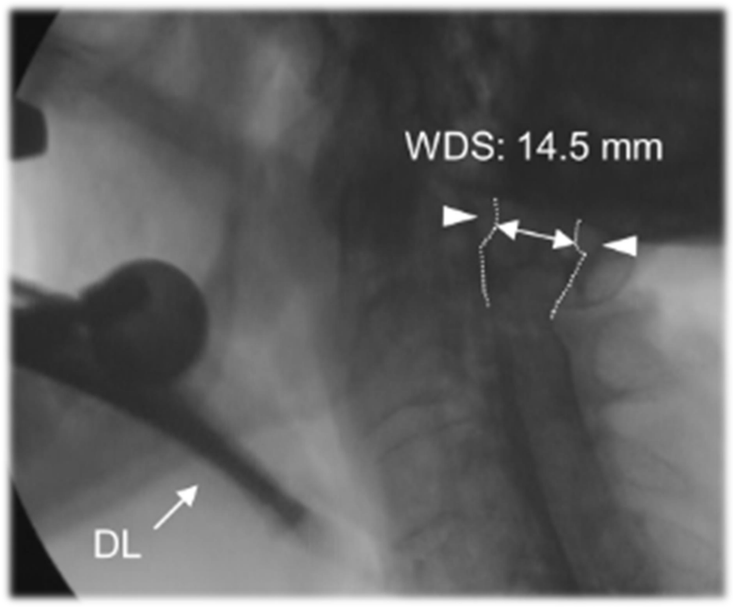
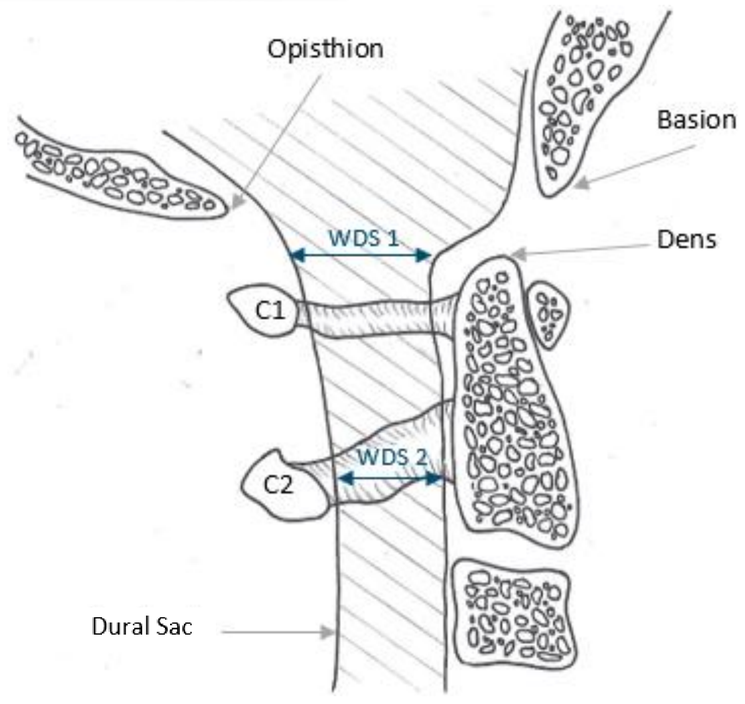


Fig 1: Direct laryngoscopy (DL) under fluoroscopy with representation of the dural sac width (WDS).

Fig. 2: Anatomy of the upper cervical spine with important landmarks and measuring points at different levels.

(WDS: Width of dural sac, C1 / C2: 1st / 2nd cervical vertebrae)



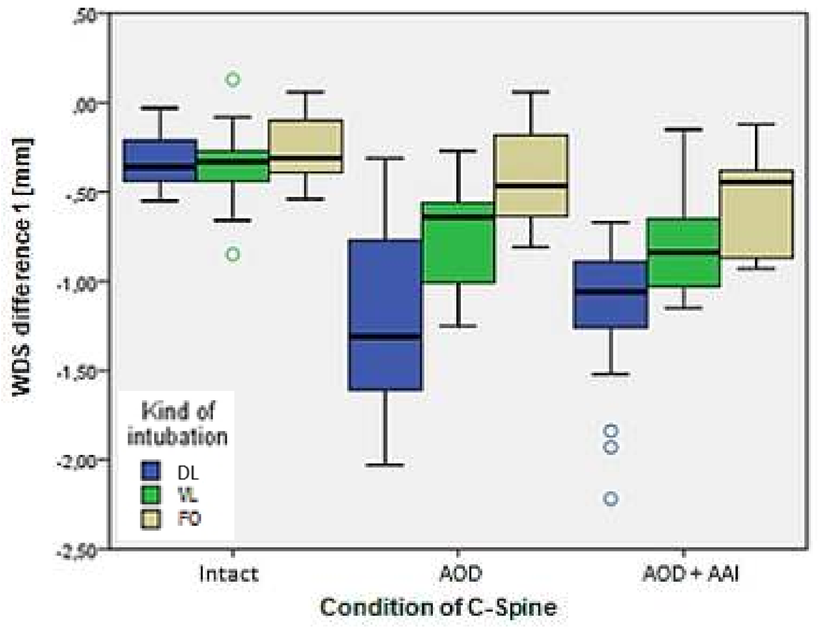


Fig. 3: Change in width of dural sac in mm at the **C0 / C1 level** (WDS 1) during conventional laryngoscopy, videolaryngoscopy and fiber optic intubation with varying cervical spine status.

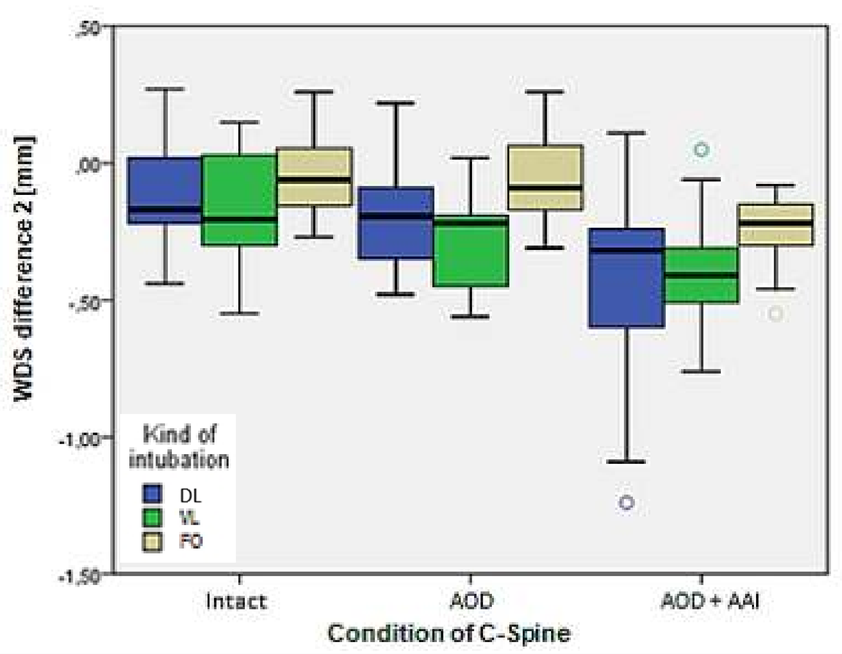


Fig. 4: Change in width of dural sac in mm at the **C1 / C2 level** (WDS 2) during conventional laryngoscopy, videolaryngoscopy and fiber optic intubation with varying cervical spine status.

Conclusion: In our human cadaver model with unstable cervical spine intubation using a **video laryngoscope** caused a **less compression** of the **dural sac** at the **C0 / C1 level** than **conventional laryngoscopy**. The **flexible fibre optics** showed **the least compression** at all measuring points.

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