Introduction: It is known that the facet joints carry approximately 20% of the spinal loads in upright position. Therefore, they play an important role in the biomechanics of the vertebral column. Facet degeneration is present in up to 80% of older adults. Facet joint arthrosis can be a severe source for back pain. Knowledge of the morphology and its changes is a prerequisite for the development of new facet joint implants that address degenerative changes with age. Therefore, the goal of this study was to investigate the anatomy of cervical and lumbar facet joints using micro-computer tomography (µCT).

Methods: Cervical and lumbar spinal segments (C6/7, L4/5) of 23 formalin fixed donors (12 female, 11 male) aged 43-98 y (median 68 y) were used. This yielded a total number of 197 single joints (C6 - 40, C7 - 38, L4 - 58, L5 - 61).

First, the vertebral bodies were dissected from the posterior structures. Subsequently, all soft tissue was removed. Lumbar superior and inferior facet joints were divided anatomically. A cylinder of 11 mm diameter was drilled from the centre of the articulating surface through the whole joint using a custom made core drill. This cylinder was scanned with a µCT using a 30 µm resolution. Due to the smaller size, both cervical facets were scanned together at a resolution of 35 µm and divided after scanning. Volumes of interest were defined to investigate the morphology of the endplates and the underlying trabecular structure seperately. Furthermore, the segments were subdivided into five equally spaced slices to investigate regional variations. Thresholding of each single image was done using an adaptive threshold.

Each subgroup was morphologically analysed with a view to age and gender. Due to equal variances we performed an ANOVA using a significance level of p=0.05.

Results: In contrast to the bony endplates of the vertebral bodies, the facet endplates are much thicker. Statistically significant difference of 8% in trabecular thickness (Tb.Th) between males and females was found. Tb.Th in the superior and inferior facets was equal. No statistically significant difference was found between the segments C6/7 and L4/5. No difference in Tb.Th could be found with respect to age for both male and female. Porosity in the endplates was on average 85% and equal amongst the segments.

Conclusion: This study presents a detailed insight into the internal structure of the facet joints. This could help to understand the load flow in the fact joints. Understanding the morphology is a prerequisite for the design of new treatment strategies.