

## Three-dimensional analysis of jaw movements during unilateral gum chewing

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Mastication is a complex task, where voluntary and automatic motor pathways are controlled by central nervous system pattern generators, and regulated by the feedback from several oral and extraoral receptors. The aim of the current investigation was to quantitatively assess the 3D jaw movements in healthy subjects performing standardized unilateral gum chewing.

Mandibular movements were non-invasively detected and recorded using an optoelectronic motion analyser, with a 60 Hz sampling rate (BTS Smart System). Height healthy subjects (mean age 29 y) chew a gum alternatively on the right (R) and left (L) side of the mouth. Nine passive markers (diameter 5 mm) were used: three created a cranial reference system; three, positioned on a stainless steel extraoral frame fixed on the mandibular anterior gingival, provided the mandibular reference system; two individualized the cutaneous projections of the R and L condyles, and one corresponded to the interincisal point. The 3D pathway of the interincisal reference point was evaluated for each chewing stroke; mean values were computed for R and L chewing.

On average, the area covered by the interincisal point was similar during R and L chewing (frontal plane,  $21.2 \pm 15.4$  vs.  $24.2 \pm 10.3$  mm<sup>2</sup>; balancing side  $0.3 \pm 0.3$  vs.  $0.4 \pm 0.3\%$ ; sagittal plane,  $9.8 \pm 4.7$  vs.  $12.1 \pm 5.2$  mm<sup>2</sup>;  $p > 0.05$ , Wilcoxon test). The interincisal path during opening and closing were similar on both sides (R chewing frontal plane, open,  $12.5 \pm 3.6$ , close  $12.7 \pm 3.8$  mm; sagittal plane open  $12.5 \pm 3.9$ , close  $12.6 \pm 3.8$  mm; L chewing frontal plane, open  $13.7 \pm 2.7$ , close  $13.6 \pm 2.5$  mm; sagittal plane, open  $14.2 \pm 3.4$ , close  $14.3 \pm 3.6$  mm; for all comparisons,  $p > 0.05$ , Wilcoxon test).

These findings characterize a healthy control group, and will enter in a reference database for oncoming surveys on pathological or pre/post treatment dental and surgical patients.

### Key words

Mandible, motion analysis, chewing