This readme file functions as an introduction and legend for the ‘Forces and Torques in Tooth Removal 2019’ dataset.   
  
**Introduction:**This dataset can be used to reproduce results from the ‘Descriptive Analysis of Forces and Torques in Tooth Removal’ paper as written by ‘van Riet’ et al. Data was captured in October 2019 in experiments on seven Fresh Frozen cadavers. Data has been pre-processed, in example, that data has been transformed into the clinical relevant tooth frames.

**Columns, general:  
A Case number**: corresponding to the cadaver number to which the jaws belong. Numbered 1 to 7.   
**B Tooth number:** The ISO (International Standards Organization number 3950, Fédération Dentaire International) system was used as dental notation system. If a first experiment did not succeed, but removal was still possible, the tooth number was extended with a 1 (second try) or 2 (third try), when applicable. In example, the 16 in case number 3 was insufficiently fixated which was noted directly at the start of treatment. A new experiment number was started as 161 (as a second try) but it was still not fixated correctly so a third attempt was necessary (162).   
**C Jaw type:** divided between upper and lower jaw  
**D Amount of roots**: as counted after the experiment. In case of complications with retained roots, a ‘-‘ is marked for missing data.  
**E Complications:** categories are ‘none’, ‘crown fracture’, ‘root fracture’, ‘boney wall fracture’ and combinations. This column was used in the paper only as a descriptive parameter. Because of the small data sample, no statistical analysis were performed.   
**F Restorative state:**  divided in ‘Sound’, ‘small direct restorations’, ‘large direct restorations’ and ‘indirect restorations’. Direct restorations could be either amalgam or composite.   
**G Periodontal state:** dividedin ‘Sound’, ‘Recession’, ‘Mild decay’, ‘Severe decay’ or combinations  
**H Surgeon:** there were 3 surgeons involved, all being expert and senior oral and maxillofacial surgeons with vast experience.   
**I Time:** duration of experiment expressed in seconds

**Columns, recorded data:**The titles of each column consists of 2 components:  
**First component, first letter:**f = forces  
t = torques  
**First component, second part:**mag =magnitude, all axis combined (as a vector, so the root of (x2+y2+z2))  
x = x-axis  
y = y-axis  
z = z-axis  
  
**Second component:**auc = area under the curve (Ns or ‘impuls’ and Nms for torques)  
auc\_sec = area under the curve divided by time in seconds  
auc\_pos = area under the curve, only positive values are included  
auc\_pos\_sec = area under the curve, only positive values are included, divided by time in seconds  
auc\_neg = area under the curve, only negative values are included  
auc\_neg\_sec = area under the curve, only negative values are included, divided by time in seconds  
max = maximum value (N for force and Nm for torques)  
sec\_pos = time in seconds, only positive values are included  
sec\_neg = time in seconds, only negative values are included

The axes’ positive and negative values correspond with directions as stated in Table 1:

Table 1: Tooth reference frame after mathematical transformation from the center of the force/torque sensor to the center of the tooth

|  |  |  |
| --- | --- | --- |
| Axis | Positive | Negative |
| X-axis force | Buccal | Palatal / Lingual |
| Y-axis force | Mesial | Distal |
| Z-axis force | Extrusion | Intrusion |
| X-axis torque | Mesial angulation | Distal angulation |
| Y-axis torque | Buccoversion | Palatoversion / Linguoversion |
| Z-axis torque | Mesiopalatal / Mesiolingual | Mesiobuccal |