

# The analysis of Valsalva leakage (VL) and Maximum urethral closure pressure (MUCP) using decision tree through machine learning

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## Hypothesis/aims of study

It has been reported that urinary leakage was not correlate to urethral pressure profile (UPP) including Maximum urethral closure pressure (MUCP). This study aimed to investigate the factors related Valsalva leakage (VL) and Maximum closure urethral pressure (MUCP) using decision tree through machine learning.

## Study design, materials and methods

24 patients who underwent urodynamics including Valsalva leakage point pressure (VLPP) and MUCP measurement at our hospital from 2017 to 2020 were recruited. We described VL and MUCP as target variables using decision tree through machine learning. As explanatory variable, particularly quantitative variables, age, MUCP, functional urethral length (FUL), vesical pressure at Valsalva maneuver voluntarily and using syringe, delivery times, body mass index (BMI), weight, height were defined. We set one as a minimum leaf size according to optimizing leaf size analysis and 10 as cross validation test times. Calculation in decision tree were performed using MATLAB™.

## Results

Five patients (20.8%) were detected VL; MUCP was 41.5 (31.75 – 60.75). FUL and weight were plotted at decision tree for presence of VL as explanatory variable, importance was 0.0228 and 0.0198 respectively. After analysis, MUCP at a leaf detected VL was 36 (31 - 67), and MSE was 0.0417. Weight and FUL, age were described on decision tree for MUCP as explanatory variable, importance was 0.0870, 0.0792, 0.1664 respectively. After analysis, the maximum detection rate was 80% at a leaf classified MUCP.

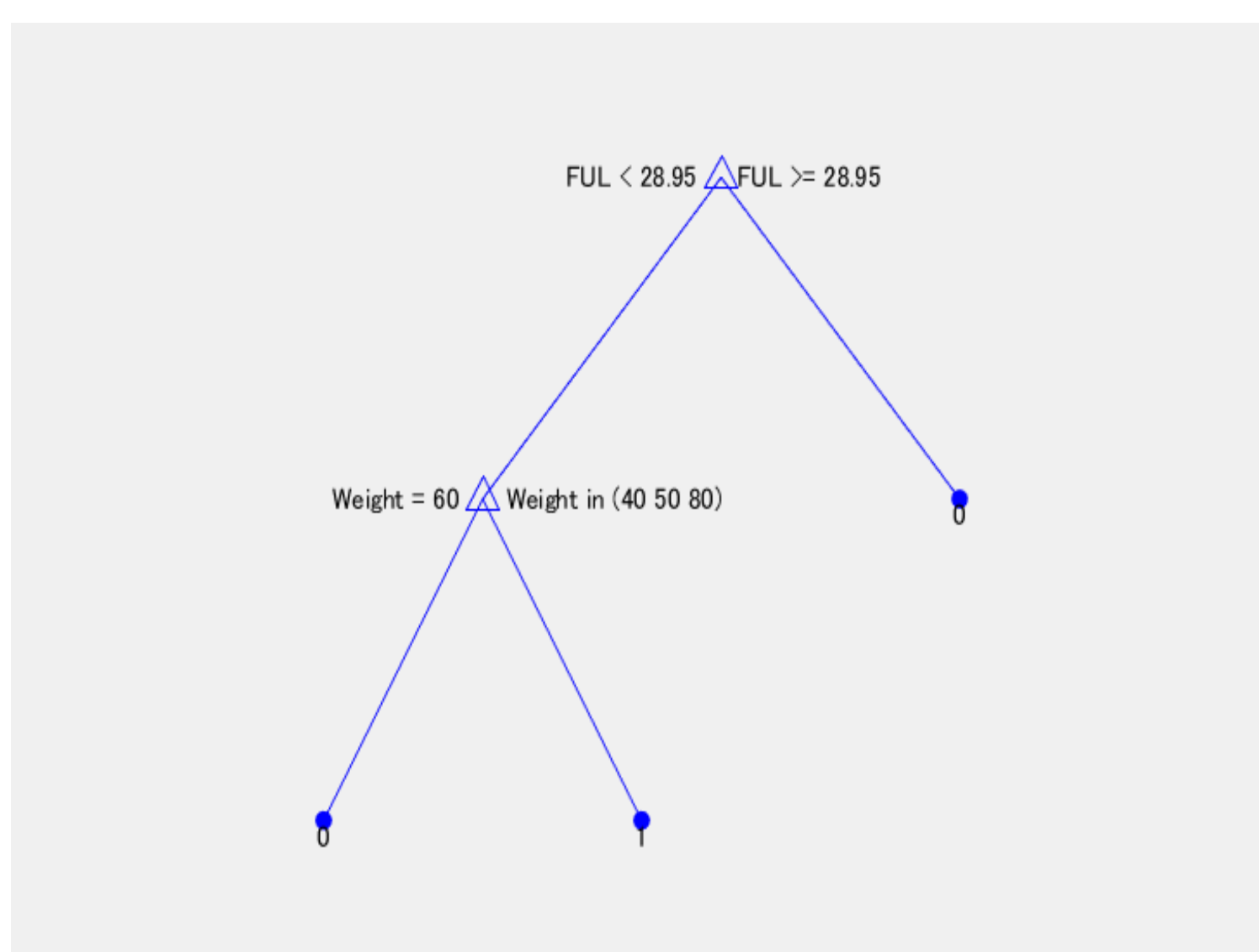


Fig. 1 A decision tree described by the presence of the urinary leakage as a target variables

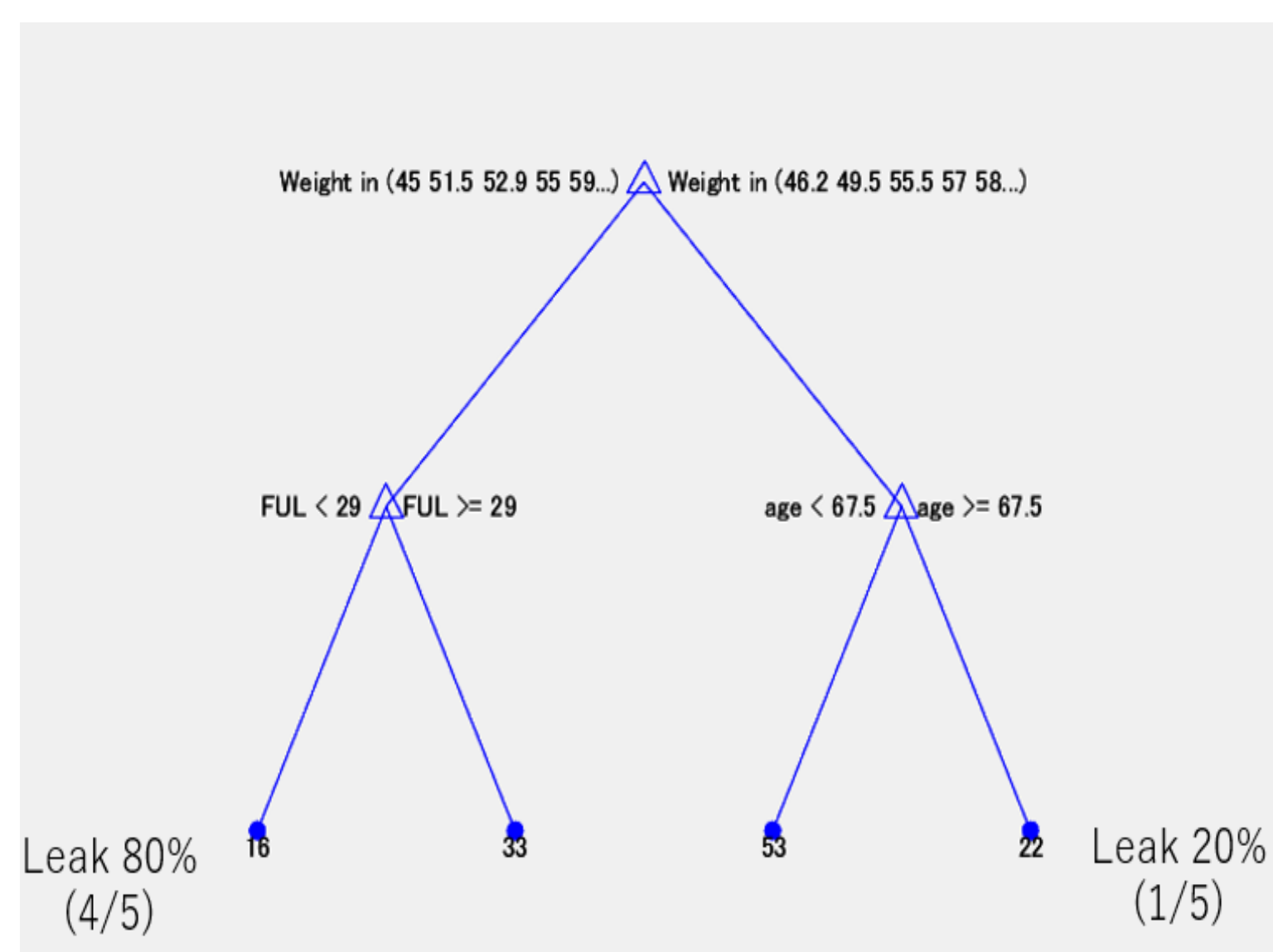


Fig. 2 A decision tree depicted by MUCP as target variables

## Interpretation of results

In this study, we investigate the factors related Valsalva leakage (VL) and Maximum closure urethral pressure (MUCP) using decision tree through machine learning. It has known that urinary leakage was not correlate to urethral pressure profile (UPP) including maximum urethral closure pressure (MUCP) in practical. Although, it might be beneficial to understand the relationship urinary leakage and UPP, obtained predictive and explanatory variables from the analysis of VL and MUCP related factors using decision tree through machine learning.

## Concluding message

These results suggested that the analysis factors related VL and MUCP using decision tree through machine learning is beneficial to understanding the relationship urinary leakage and UPP.