Artificial neural network for lumbar discectomy outcome prediction

The aim of a study was to develop an artificial neural networks (ANNs) model for predict lumbar discectomy prognosis in lumbar disc herniation (LDH).

An ANN model and a logistic regression (LR) model were used to predict outcomes outcomes. The age, gender, duration of symptoms, smoking status, surgical level, visual analog scale (VAS) of leg/back pain, the Zung Depression Scale (ZDS), and the Japanese Orthopaedic Association (JOA) Score, were determined as the input variables for the established ANN model. The Macnab classification was used for outcome assessment. ANNs on data from LDH patients, who had surgery, were trained to predict 2-year successful discectomy using several input variables. Sensitivity analysis to the established ANN model was used to identify the relevant variables. For evaluating the two models, the area under a receiver operating characteristic (ROC) curve (AUC), accuracy rate of predicting, and Hosmer-Lemeshow (H-L) statistics were considered.

A total of 203 (96 male, 107 female, mean age 48.3±9.8 years) patients were caterigized into training, testing, and validation data sets consisting of 101, 51, and 51 cases, respectively. Surgical successful outcome was: categorized as excellent, 32%; good, 40.9%; fair, 20.7% and poor, 6.4% at 2-year follow-up. Compared to the LR model, the ANN model showed better results: accuracy rate, 95.8%; H-L statistic, 41.5%; and AUC, 0.82% of patients.

The findings show that an ANNs can predict successful surgery outcome with a high level of accuracy in LDH patients. Such information is of use in the clinical decision-making process [1)].

1)
Azimi P, Benzel EC, Shahzadi S, Azhari S, Mohammadi HR. The prediction of successful surgery outcome in lumbar disc herniation based on artificial neural networks. J Neurosurg Sci. 2016 Jun;60(2):173-7. PubMed PMID: 27150542.