INTRODUCTION:
The Munting stemless hip prosthesis was developed in the early eighties at the Orthopaedic Laboratory of the Université catholique de Louvain in Brussels, Belgium, by Pr E. Munting and Pr A. Vincent. This device was designed for young and active patients with the goal of preventing the bone loss commonly associated with femoral components having intramedullary stems [1,2]. Nevertheless, some early clinical failures were reported up to 2 years after surgery and were possibly related to inadequate implant positioning [5].

METHOD:
We retrospectively reviewed a consecutive series of 103 patients who received a Munting hip prosthesis between 1989 and 1998. Clinical data were provided by the Université catholique de Louvain in Brussels, (Tab.1 and Tab.2). Clinical failures that happened later than 2 years after surgery were excluded from the analysis, as these were mostly related to acetabular polyethylene wear. The objective was to study the relationship between early clinical response (CR) and biomechanical factors such as patient age (A), implant position angle (IPA), pre-Op bone quality (BQ), body mass (BM) and height (H).

Classification of the clinical response (CR) is based on qualitative analysis of bone remodeling visible on postoperative X-Rays in region of interest ROI3 (Fig.3). CR1 is corresponding to a medial bone/implant interface rapid bone loss in ROI3 (77% of CR1 become early clinical failures). CR2 shows a progressive bone loss in ROI3 reaching steady state at ~12 months (Fig.4 and Fig.5). CR3 has a steady state bone density in ROI3. Retrospective assessment of pre-Op bone quality (BQ) in ROI3 is done based on patient hip etiology (Tab.2) [7]. Post-Op implant position angle (IPA) between neck axis and the femur lateral cortex is measured by 2 observers [8] on digitally stored X-Rays (Fig.6).

RESULTS:
From CART analysis, high-risk group (CR1, 22%) includes patients with IPA < 126° and BM > 85kg. Patients with IPA < 124° are at the high-risk of early clinical failure independently of their body mass. Intermediate group of patients with IPA ≥ 135° (CR2, 10%) has ROI3 calcar progressive bone loss without clinical failure. Reference group (CR3, 68%) has a steady state bone density, 126° < IPA < 135° (Fig.7).

Two multivariate analysis of the relationships between 5 biomechanical factors A, IPA, BQ, BM, H and the dependent variable CR are done using Classification Tree (CART, Systat11) and a Multinomial Logistic regression model (Eq.1, Systat 11).

DISCUSSION:
As per our hypothesis, implant position (IPA) is the main factor influencing the short term clinical result of the Munting hip prosthesis. To reach short term survival probability of almost 100%, IPA should not be less than 128° for an average body mass of 75kg (Fig.8) and should not be less than 130° for patients heavier than 85kg (Fig.7 and Fig.8).

In addition to the impact of this study for the surgeon and his clinical practice, this retrospective multifactorial analysis will be used as a reference for future work to verify a bone physiological remodeling algorithm proposed to describe bone adaptation behaviour after surgery using finite element analysis (FEA).

REFERENCES: