INTRODUCTION:
Three-dimensional preoperative planning and bone tumor resection by navigation have been used in the last ten years [1]. However, no study to date, as far as we know, has directly provided evidence linking surgical specimen in virtual scenarios and accuracy in preoperative planning and navigation. The objective of this study was to develop a method capable of determining the accuracy of osteotomies planned and guided by navigation. We hypothesize that the surgical specimen scanned and 3D reconstructed will be an acceptable method to determine the accuracy qualitative and quantitatively of a virtual planning and navigation.

METHODS:
A total of eleven patients were evaluated between May 2010 and February 2011, age range: 10-68, 37.8 mean; 4 males and 8 females. According to locations: femur (8), pelvis (2), tibia (1), humerus (1). All patients were planned in a virtual scenario using CT and MRI fusion (Fig 1). Nine patients were planned for uniplanar osteotomy, 1 biplanar and 2 quadriplanar. Minimal margin was determined in each plane measuring closest proximity between tumor and cutting plane. After tumor resection guided by navigation, 3D reconstructions of all specimens were created from CT images. Using specialized 3D software, virtual surgical specimen was superposed on preoperative planning model. Qualitative differences between plane planned and specimen’s plane were evaluated using a color scale and histograms (Fig 2). Quantitative differences were reported as distances between plane planned and plane realized. Negatives values indicates closest proximity to the tumor. (Table 1)

RESULTS:
The mean of quantitative comparisons between plan planned and specimen’s plane is 1.01 millimeters (SD: 3.04) for all the cases, evaluating 19 planes in total (Table 1). Qualitative differences were possible using color scale and illustrated in histograms able to visualized differences between minimal margin and cutting saw (Fig 2).

DISCUSSION:
The results suggest that a robust technique has been established. One limitation of this study is the small amount of samples. On the other hand, the results stemming from the use of this protocol enable accurate considerations from a specimen scanned achieving an acceptable score in order to define differences between plane planned and realized.

SIGNIFICANCE:
According to clinical relevance, this work demonstrates the usefulness of three-dimensional models from surgical specimen when surgeons need determine quantitative and qualitative accuracy of 3D planning and navigation procedure.

REFERENCES: