INTRODUCTION
Surgery is treatment of choice for intertrochanteric hip fracture. As a golden standard, stable fractures should be treated with DHS system, and it had bee followed for decades. The successful rate of DHS systems is excellent in stable fractures with few complications and the technique is simple. In the hence, DHS systems in treating stable intertrochanter hip fractures dominates all over the world. As minimal invasion surgery prevailing today, however, the traditional DHS systems used in operation with a long four-holed side plate, which made the surgical incision longer than other hip surgical procedures. DHS systems with two holed side plate appeared several years ago and had been applied clinically with good results. Clinical and biomechanical researches revealed that DHS systems with two holed side plate could reach the result as the one of four holed side plate, but with smaller incision, shorter operation time and less blood loss during and after operation. In this study we simulated simple trochanteric fracture model using two holed and four holed DHS systems under one reference load (stance phase of the gait cycle). Several different situations were analysed by finite elements, and we would discuss the optimized design for screw position in two holed DHS systems that could get maximum fixation.

METHODS
The left femur of a 70-year-old man donor was scanned by computer tomography (CT) to obtain a series of cross section image of femur. The distance between slices was 3 mm along the epiphysis and 5 mm along the diaphysis. This information was used to obtain the 3D geometry and associated finite element mesh with the CAD package Amira and Ansys. Behavior of bone was approximated by a isotropic linear elastic material. Cortical and cancellous bone were distinguished with Image J. Only one loading condition was considered, corresponding to the stance phase of the gait cycle; 2460 N acting on the femoral-head at a 238 angle with the frontal plane and 68 with sagittal plane. A second load was placed on the greater trochanter, corresponding to the action of three muscles (gluteus minimus, medius and maximus); 1700 N at a 248 angle with the frontal plane and 158 with the sagittal plane. A third load was applied to the lesser trochanter, associated with the effect of the psoas-iliac muscle; 771 N and an angle of 418 with the frontal plane and 268 with the sagittal plane. The femur was restrained at middle diaphysis;. We used an appropriately sized two holed DHS
systems which was 200 mm long and 12 mm in distal diameter. The lag screw was 70 mm long, 8 mm in diameter and placed at a $135^\circ$ angle. The mechanical properties of the implants were a modulus of elasticity of $2.00 \times 10^5$ N/mm$^2$ and a Poisson’s ratio of 0.3. The interface between the bone and the implant was considered to be bonded.

Fractures were modeled with contact pairs, establishing a surface-to-surface asymmetric contact between both sides of the fracture surface. We have used a friction coefficient sufficiently high to avoid sliding between elements and the interpenetration has been considered null. The simulation was presumed to be early postoperative period to ignore the effect of the callus.

**RESULTS AND DISCUSSION**

Results of our study showed that DHS systems with two holed side plate behaved as well as those of four holed side plate, no matter in fracture displacements, stress distribution in the femur along the vertical (z) axis and Von Misses stress distribution in the implants. Besides, we will focus our discuss on the optimized design for screw position at DHS systems with two holed side plate.

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