THE ROLE OF PREOPERATIVE COMPUTED TOMOGRAPHY IN SURGICAL PLANNING OF INTERTROCHANTERIC FEMUR FRACTURES FIXATION

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Introduction

Intertrochanteric fractures are common problem especially in the elderly and are becoming more frequent as the proportion of the elderly in the population increases. Sometimes these fractures can become life-threatening disasters during or after treatment in the elderly. Surgery is the treatment of choice for both stable and unstable intertrochanteric fractures, with the goal of stable fixation to allow early mobilization and to restore the patient's previous level of activity. Dynamic hip screws have been widely used for the treatment of these fractures because of their biomechanical advantages. Factors contributing to fixation failures in intertrochanteric fractures using dynamic hip screws are facture stability, comminution, osteoporosis, the type of reduction and surgical techniques. These factors have been involved in the difficulty in achieving and maintaining stable reduction and rigid internal fixation of unstable fractures. There are many classification systems for these fractures based on plain X-ray findings including the Evans system, the Jensen's system, the AO/OTA system, and the Boyd and Griffin system. Nakano proposed a 3D-CT classification system in Japan to avoid misunderstanding of the fracture pattern by plain X-rays because femoral trochanteric fractures are sometimes very difficult to precisely diagnose.

Aim of the work

The aim of this work was to evaluate the role of preoperative computed tomography in surgical planning of intertrochanteric femoral fractures fixation.

Subjects and Methods

A prospective study included 40 patients with intertrochanteric femoral fractures admitted in El-Hadra University Hospital, Alexandria, Egypt. Informed consent was taken from each patient included in the study and they were subjected to history taking, physical examination, necessary laboratory investigation and imaging by x-ray and CT. They were classified into stable and unstable intertrochanteric fractures according to the x-ray based AO/OTA classification and according to Nakano 3D-CT classification.**(Figure).**

The percentage of fracture patterns classified as unstable fractures in CT and were previously classified as stable fractures in X-rays was calculated and the correlation between x-ray based AO/OTA classification and 3D-CT classification was analysed. They were operated on using DHS and were followed up radiologically and clinically by Harris Hip Score (HHS) after 6 months.

Results

Table 1: Comparison between X-ray and CT in classification of fracture patterns (n=40)

	X-ray (n=40) No. (%)	CT (n=40) No. (%)	^{McN}p
Unstable	16 (40%)	22 (55%)	0.031*
Stable	24 (60%)	18 (45%)	

McN: McNemar test *: Statistically significant at $p \le 0.05$

Table 2: Relation between X-ray and CT classifications (n=40)

CT	X-ray: Unstable (n=16) No. (%)	X-ray: Stable (n=24) No. (%)	χ^2	p
Unstable	16 (100%)	6 (25%)	21.818*	<0.001*
Stable	0 (0%)	18 (75%)		

χ^2: Chi square test p: p value for comparing between the two studied categories
*: Statistically significant at $p \le 0.05$

Table 3: Relation between HHS and X-ray and CT classifications (n=38#)

	N	HHS: Mean ± SD.	HHS: Median (Min. – Max.)	Test of sig.	p
X-ray					
Unstable	16	83.5 ± 4	83.5 (75 – 93)	t= 3.102*	0.004*
Stable	22	88.4 ± 5.3	89 (75 – 100)		
CT					
Unstable	21	83.8 ± 4.4	84 (75 – 93)	t= 3.783*	0.001*
Stable	17	89.5 ± 4.8	89 (79 – 100)		

t: Student t-test p: p value for comparing between the different studied categories
*: Statistically significant at $p \le 0.05$ #: Two cases died before the end of follow up

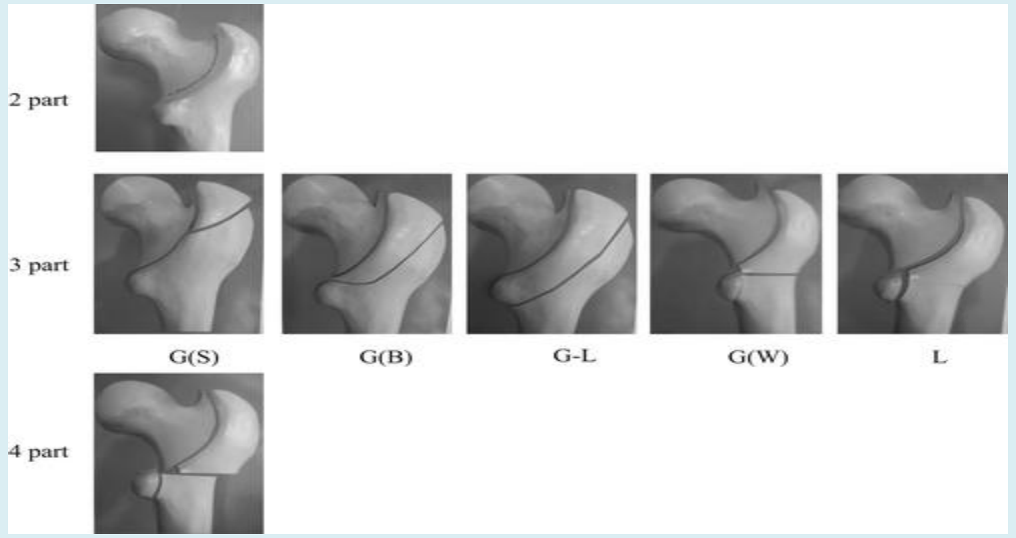

Figure: Fracture classification with three-dimensional computed tomography (3D-CT). G: Greater trochanter, L: Lesser trochanter, (S): Small, (B): Big and (W): Whole.

Conclusion

We can suggest using 3D-CT classification system for intertrochanteric fractures for better assessment of the fracture pattern of the greater trochanter, particularly large oblique fragments (G-L) which is difficult to be visualized on plain x-rays. 3D-CT delineates the fracture line clearly to classify the fracture pattern easily. The superolateral support in the form of the greater trochanter is as important as the posteromedial lesser fragment in assessing the stability of the fracture pattern. DHS has the advantage that it allows controlled collapse at fracture site. It can be used for stable and unstable fracture with satisfactory HHS in the end of the postoperative follow up period but it's better not to be used alone or to use intramedullary nail instead if lateral wall isn't intact and the lesser trochanter is fractured.