RESULTS

This study was performed on 40 patients were attending to the Rheumatology and Orthopedic clinics of Benha University Hospitals and ten asymptomatic volunteers as a control group.

Both the patients and the asymptomatic volunteers underwent computerized tomography of their patellofemoral joint , midpatellar transaxial cuts are taken at 0 , 15 , 30 and 45 degree of knee flexion and three measurments are obtained from each image , the FTA , the CA and the PTA ***(Tables 16, 17 & 18).***

The following results are found

The average congurence angle of the control group are ***(Table 1):***

- + 2.1 degrees at full knee extention ranging from +15 degrees to –8 degrees with SD : 7.7.
- -3 degrees at 15 degrees of knee flexion ranging from +2 degrees to – 12degrees with SD : 5.1.
- -3 degrees at 30 degrees of knee flexion ranging from +2 degrees to – 12degrees with SD : 4.9.
- -4 degrees at 45 degrees of knee flexion ranging from +1 degrees to – 15degrees with SD : 5.7.

From these resultes it is noticed that some normal patellofemoral joints tend to be lateralized at full knee extention , however , this lateralization is completely reduced at 15 degrees of knee flexion and at this position the highermost congurence angle was +2degrees ***So*** , The patella will be considered subluxated if it remained lateralized (CA more than +2) at 15 degrees of knee flexion.

The average patellar tilt angle of the control group are ***(Table 2):***

- + 18 degrees at full knee extention ranging from +35 degrees to +8 degrees with SD : 9.
- +17 degrees at 15 degrees of knee flexion ranging from +31 degrees to +8degrees with SD : 8.

- +16 degrees at 30 degrees of knee flexion ranging from +29 degrees to +8degrees with SD : 7.
- +14 degrees at 45 degrees of knee flexion ranging from +26 degrees to +8degrees with SD : 6.3.

These results show that the PTAs of the control group are in the high positive range and cosiderably constant between 0 and 45 degrees of knee flexion and although there is a wide range of angles , at no position , any control patellofemoral joint had a PTA less than +8 degrees ***So*** PTA of +8 degrees will be considered the lower limit of normal tilting.

Based on these two criteria (CA more than +2 degrees and PTA less than +8 degrees at 15 degrees of knee flexion) three types of patellofemoral malalignment were defined and used to diagnose and classify patients with patellofemoral pain .

From the 40 patients of the study five cases (12.5 %) showed no evidence of patellofemoral malalignment ***(Figure 4)***.

Among the symptomatic group , there were 22 cases (55 %) with markedly elevated CA throughout the different degrees of knee flexion compared to the control group ($p < 0.001$) representing subluxated patella ***(Table 19& 20)***.

The mean CAs of this group are ***(Tables 4 & 7)***:

- +25.4 degrees at full knee extention ranging from +50 degrees to +15 degrees with SD : 9.7.
- +15.9 degrees at 15 degrees of knee flexion ranging from +43 degrees to +5degrees with SD : 9.7.
- +7.3 degrees at 30 degrees of knee flexion ranging from +32 degrees to –5degrees with SD : 10.8.
- +0.5 degrees at 45 degrees of knee flexion ranging from +25 degrees to –12degrees with SD : 10.5.

With progressive knee flexion , the subluxation tend to improve (diminishing CA) and several cases (14 cases) were completely reduced at 30 degrees of knee flexionalthough the average CA at this position was +7.3 degrees.

This 22 cases were then subdivided those that suubluxated with or without patellar tilting according to their PTAs . Those unassociated with tilting are called type I malalignment cases and they have PTAs comparable to the controls. The other group associated with patellar tilting are called type II malalignment cases and they have PTAs close to 0 degrees throughout the range of motion.

The mean PTAs of type I malalignment (12 cases , 30 %) are*(Table 5):*

- +18.7 degrees at full knee extention ranging from +26 degrees to +18 degrees with SD : 5.5.
- +17.7 degrees at 15 degrees of knee flexion ranging from +25 degrees to +17degrees with SD : 5.1.
- +17.2 degrees at 30 degrees of knee flexion ranging from +25 degrees to +17degrees with SD : 5.
- +15.3 degrees at 45 degrees of knee flexion ranging from +24 degrees to +15 degrees with SD : 5.3.

These results are comparable to the PTAs of the control group and no statistical significant difference was found p>0.05 *(Table 19).*

The mean PTAs of type II malalignment (10 cases , 25 %) are *(Table 8):*

- +2.1 degrees at full knee extention ranging from +12 degrees to -8 degrees with SD : 9.6.
- +0.7 degrees at 15 degrees of knee flexion ranging from +8 degrees to -8degrees with SD : 5.6.
- -0.8 degrees at 30 degrees of knee flexion ranging from +6 degrees to -9degrees with SD : 4.8.
- -2.4 degrees at 45 degrees of knee flexion ranging from +5 degrees to -9 degrees with SD : 4.

These results demonstrate that the PTAs of this group lie in the low positive range at full knee extention and gradually diminish with progressive knee flexion to much lower than the +8 degrees considered the lower limit of normal PTA.

These PTAs of this type represent a statistically significant difference ($p < 0.001$) from type I and controls *(Table 20)*.

A third group of patients are found to have isolated patellar tilting and called type III malalignment . The congurence angles of this group is comparable to the control group and their average are *(Table 10):*

- +2.6 degrees at full knee extention ranging from +13 degrees to -7 degrees with SD : 6.6.
- -2 degrees at 15 degrees of knee flexion ranging from +2 degrees to –12 degrees with SD : 5.3.
- -3.4 degrees at 30 degrees of knee flexion ranging from +2 degrees to –12 degrees with SD : 5.
- -3.7 degrees at 45 degrees of knee flexion ranging from +1 degrees to –15degrees with SD : 5.6.

These CAs are closely resembling that of the control group so this group have isolated patellar tilt with no subluxation and no statistical significant difference was found *(Table 21)*.

The mean PTAs of this group are *(Table 11):*

- +9.7 degrees at full knee extention ranging from +23 degrees to – 6 degrees with SD : 9.
- +5.5 degrees at 15 degrees of knee flexion ranging from +13 degrees to –6 degrees with SD : 6.5.
- +2 degrees at 30 degrees of knee flexion ranging from +6 degrees to –5 degrees with SD : 3.6.
- 0 degrees at 45 degrees of knee flexion ranging from +4 degrees to –6degrees with SD : 2.9.

These results show that although at full knee extention the average is +9.7 (i .e within the lower range of normal . with further flexion to 45 degrees , the PTAs significantly diminished ($p < 0.001$ at 45 degrees of knee flexion).

The change in the PTAs between full knee extention and 45 degrees of knee flexionis calculated for each group it was found that :

- Average for the control group : 4.
- Average for type I malaignment : 3.5.
- Average for type II malaignment : 4.5.
- Average for type III malaignment : 9.7.

SO, Type III malaignment had the greatest change in the PTAs ($p < 0.01$) compared to the control and type I patients ***(Table 21)***.

Also, type II malalignment had greater changes in their PTAs than the control and type I malalignment ($p < 0.05$ versus control and type I) but less than the change type III malalignment ***(Table 20)***.

For detection of relationship between anatomical variations and the occurrence of the three types of malalignment and reccurense of the injury, the FTAs is measured for each patient and it is found that :

Average ot FTAs for controls are ***(Table 3):***

- 150 degrees at full knee extention ranging from 165 degrees to 138 degrees with SD : 8.7.
- 138 degrees at 15 degrees of knee flexion ranging from 150 degrees to 128 degrees with SD : 9.2.
- 129 degrees at 30 degrees of knee flexion ranging from 133 degrees to 120 degrees with SD : 4.7.
- 120 degrees at 45 degrees of knee flexion ranging from 125 degrees to 117degrees with SD : 2.8.

Mean ot FTAs for type I cases are ***(Table 6):***

- 157.3 degrees at full knee extention ranging from 172 degrees to 143 degrees with SD : 9.8.
- 150 degrees at 15 degrees of knee flexion ranging from 164 degrees to 137 degrees with SD : 10.

- 153.7 degrees at 30 degrees of knee flexion ranging from 160 degrees to 150 degrees with SD : 4.3.
- 146 degrees at 45 degrees of knee flexion ranging from 157 degrees to 142 degrees with SD : 5.3.

Comparison between the above result demonstrate that :

- No anatomical difference between controls and type III patients.
- Cases with type I malalignment have shallower trochlea (higher FTAs) compared with the control group but they did not achieved a statistical significant difference $p > 0.05$ ***(Table 19)***.
- Cases with type II malalignment have shallower trochlea (higher FTAs) than both controls and type I cases and have statistical significant difference ($p < 0.02$) between them and controls ***(Table 20)***.

-Cases with history of recurrent dislocation have the highest FTAsan have a highly significant increase in FTAs throughout the variable flexion degrees ($p < 0.03$) ***(Table 22)***.

So, the higher the FTAs , The more chance of ocurrence of recurrent dislocation . type II and type I malalignment respectively.

Finally, the sensetivity of this work is 87.5 % as 35 of 40 symptomatic cases had an abnormal scans.

Case No	Degree	0°	15°	30°	45°
1		15°	2°	2°	1°
2		11°	2°	1°	1°
3		8°	0°	0°	0°
4		5°	1°	0°	0°
5		3°	2°	1°	0°
6		0°	0°	-1°	-2°
7		-2°	-5°	-5°	-6°
8		-4°	-7°	-7°	-9°
9		-7°	-8°	-9°	-10°
10		-8°	-12°	-12°	-15°

Table(1). Values of the congruence angle in the control group.

Case No	Degree	0°	15°	30°	45°	change
1		35°	31°	29°	26°	9°
2		29°	28°	26°	24°	5°
3		25°	22°	20°	17°	8°
4		20°	19°	17°	14°	6°
5		18°	17°	16°	14°	4°
6		16°	15°	14°	13°	3°
7		13°	13°	12°	10°	3°
8		11°	11°	10°	9°	2°
9		9°	9°	9°	9°	0°
10		8°	8°	8°	8°	0°

Table (2). Values of the patellar tilt angle in the control group.
NB: Change means the change in the patellar tilt angle between 0° and 45° of knee flexion.

Case No	Degree	0°	15°	30°	45°
1		165°	150°	133°	125°
2		162°	149°	132°	123°
3		156°	146°	133°	120°
4		150°	143°	133°	122°
5		150°	139°	131°	118°
6		147°	135°	129°	119°
7		146°	131°	126°	117°
8		144°	128°	125°	118°
9		142°	126°	123°	117°
10		138°	128°	120°	117°

Table (3). Values of the femoral trochlear angle in the control group.

Case No	Degree	0°	15°	30°	45°
1		40°	32°	27°	20°
2		25°	17°	13°	5°
3		25°	15°	2°	-5°
4		24°	14°	2°	-4°
5		23°	11°	0°	-7°
6		22°	15°	2°	0°
7		21°	11°	2°	-5°
8		20°	11°	1°	-7°
9		18°	12°	2°	-5°
10		17°	10°	0°	-6°
11		16°	8°	-1°	-8°
12		16°	7°	-2°	-8°

Table(4). Values of congruence angle in pateints with type I patellofemoral malalignment.

Case No	Degree 0°	15°	30°	45°	change
1	26°	25°	25°	24°	2°
2	19°	19°	18°	16°	3°
3	28°	25°	24°	22°	8°
4	16°	14°	13°	10°	6°
5	17°	17°	16°	13°	3°
6	10°	10°	10°	9°	1°
7	21°	19°	18°	16°	5°
8	26°	25°	25°	24°	2°
9	13°	12°	12°	10°	3°
10	16°	16°	15°	13°	3°
11	15°	14°	14°	12°	3°
12	18°	17°	17°	15°	3°

Table (5). Values of the patellar tilt angle in pateints with type I patellofemoral malalignment.

Case No	Degree 0°	15°	30°	45°
1	143°	136°	128°	120°
2	146°	138°	131°	125°
3	162°	157°	150°	142°
4	150°	142°	134°	127°
5	162°	157°	150°	142°
6	163°	156°	148°	140°
7	172°	164°	151°	143°
8	169°	160°	150°	142°
9	167°	159°	150°	142°
10	155°	148°	140°	133°
11	153°	145°	136°	128°
12	146°	137°	130°	125°

Table (6). Values of the femoral trochlear angle in pateints with type I patellofemoral malalignment.

Case No	Degree	0°	15°	30°	45°
1		50°	43°	30°	22°
2		45°	36°	32°	25°
3		36°	16°	11°	3°
4		31°	22°	15°	8°
5		28°	19°	12°	4°
6		25°	16°	12°	5°
7		22°	12°	0°	-1°
8		18°	8°	0°	-9°
9		16°	6°	-1°	-10°
10		15°	5°	-5°	-12°

Table(7). Values of congruence angle in pateints with type II patellofemoral malalignment.

Case No	Degree	0°	15°	30°	45°	change
1		12°	8°	6°	5°	7°
2		8°	5°	3°	0°	8°
3		3°	3°	0°	-2°	5°
4		-2°	-2°	-3°	-4°	2°
5		-5°	-6°	-6°	-7°	2°
6		10°	7°	5°	2°	8°
7		7°	5°	2°	-1°	8°
8		0°	-1°	-2°	-3°	3°
9		-4°	-4°	-4°	-5°	1°
10		-8°	-8°	-9°	-9°	1°

Table (8). Values of the patellar tilt angle in pateints with type II patellofemoral malalignment.

Case No	Degree	0°	15°	30°	45°
1		176°	167°	155°	144°
2		180°	172°	160°	149°
3		162°	154°	145°	137°
4		172°	168°	160°	157°
5		150°	140°	132°	126°
6		166°	160°	154°	149°
7		151°	145°	137°	129°
8		155°	148°	140°	133°
9		176°	167°	155°	144°
10		172°	164°	151°	143°

Table (9). Values of the femoral trochlear angle in pateints with type II patellofemoral malalignment.

Case No	Degree	0°	15°	30°	45°
1		13°	2°	2°	1°
2		12°	2°	2°	1°
3		9°	2°	1°	1°
4		7°	1°	1°	0°
5		5°	2°	0°	0°
6		4°	1°	-3°	0°
7		3°	1°	-2°	-4°
8		1°	-3°	-3°	-4°
9		0°	-2°	-3°	-1°
10		-1°	-1°	-6°	-5°
11		-6°	-10°	-10°	-9°
12		-6°	-12°	-12°	-15°
13		-7°	-11°	-12°	-14°

Table(10). Values of congruence angle in pateints with type III patellofemoral malalignment.

Case No	Degree	0°	15°	30°	45°	change
1		23°	13°	6°	3°	20°
2		19°	12°	5°	2°	17°
3		21°	13°	5°	2°	19°
4		13°	9°	4°	2°	11°
5		8°	5°	2°	0°	8°
6		5°	1°	0°	-1°	6°
7		16°	11°	4°	1°	15°
8		1°	-2°	-3°	-3°	4°
9		-6°	-6°	-5°	-6°	0°
10		14°	10°	3°	-1°	15°
11		-3°	-4°	-3°	-4°	1°
12		6°	4°	3°	1°	5°
13		10	6°	5°	4°	6°

Table (11). Values of the patellar tilt angle in pateints with type III patellofemoral malalignment.

Case No	Degree	0°	15°	30°	45°
1		166°	156°	143°	131°
2		163°	151°	139°	127°
3		157°	146°	134°	123°
4		152°	140°	129°	120°
5		147°	135°	121°	110°
6		146°	132°	120°	111°
7		142°	130°	121°	114°
8		144°	131°	120°	112°
9		150°	139°	127°	115°
10		155°	142°	128°	120°
11		160°	148°	135°	122°
12		162°	150°	140°	128°
13		168°	155°	143°	130°

Table (12). Values of the femoral trochlear angle in pateints with type III patellofemoral malalignment.

Case No	Degree	0°	15°	30°	45°
1		45°	36°	32°	25°
2		31°	22°	15°	8°
3		25°	15°	2°	-5°
4		25°	16°	12°	5°
5		23°	11°	0°	-7°
6		21°	11°	2°	-5°
7		20°	11°	1°	-7°
8		16°	6°	-1°	-10°

Table(13). Values of congruence angle in pateints with recurrent patellofemoral malalignment.

Case No	Degree	0°	15°	30°	45°	change
1		8°	5°	3°	0°	8°
2		-2°	-2°	-3°	-4°	2°
3		28°	25°	24°	22°	8°
4		10°	7°	5°	2°	8°
5		17°	17°	16°	13°	3°
6		21°	19°	18°	16°	5°
7		26°	25°	25°	24°	2°
8		-4°	-4°	-4°	-5°	1°

Table (14). Values of the patellar tilt angle in pateints with recurrent patellofemoral malalignment.

Case No	Degree	0°	15°	30°	45°
1		180°	172°	160°	149°
2		172°	168°	160°	157°
3		162°	157°	150°	142°
4		166°	160°	154°	149°
5		162°	157°	150°	142°
6		172°	164°	151°	143°
7		169°	160°	150°	142°
8		176°	167°	155°	144°

Table (15). Values of the femoral trochlear angle in pateints with recurrent patellofemoral malalignment.

Case No	Degree	0°	15°	30°	45°
1		50°	43°	30°	22°
2		45°	36°	32°	25°
3		40°	32°	27°	20°
4		36°	16°	11°	3°
5		31°	22°	15°	8°
6		28°	19°	12°	4°
7		25°	17°	13°	5°
8		25°	15°	2°	-5°
9		25°	16°	12°	5°
10		24°	14°	2°	-4°
11		23°	11°	0°	-7°
12		22°	15°	2°	0°
13		22°	12°	0°	-1°
14		21°	11°	2°	-5°
15		20°	11°	1°	-7°
16		18°	8°	0°	-9°
17		18°	12°	2°	-5°
18		17°	10°	0°	-6°
19		16°	8°	-1°	-8°
20		16°	6°	-1°	-10°
21		16°	7°	-2°	-8°
22		15°	5°	-5°	-1°2
23		13°	2°	2°	1°
24		12°	2°	2°	1°
25		10°	1°	1°	1°
26		9°	2°	1°	1°
27		7°	1°	1°	0°
28		5°	2°	0°	0°
29		5°	2°	1°	1°
30		4°	1°	-3°	0°
31		3°	1°	-2°	-4°
32		1°	1°	0°	0°
33		1°	-3°	-3°	-4°
34		0°	-2°	-3°	-1°
35		-1°	-1°	-6°	-5°
36		-3°	-5°	-7°	-8°
37		-4°	-8°	-9°	-5°
38		-6°	-10°	-10°	-9°
39		-6°	-12°	-12°	-15°
40		-7°	-11°	-12°	-14°

Table(16). Values of congruence angle in 40 cases of clinically diagnosed patellofemoral malalignment.

Case No	Degree 0°	15°	30°	45°	change
1	12°	8°	6°	5°	7°
2	8°	5°	3°	0°	8°
3	26°	25°	25°	24°	2°
4	3°	3°	0°	-2°	5°
5	-2°	-2°	-3°	-4°	2°
6	-5°	-6°	-6°	-7°	2°
7	19°	19°	18°	16°	3°
8	28°	25°	24°	22°	8°
9	10°	7°	5°	2°	8°
10	16°	14°	13°	10°	6°
11	17°	17°	16°	13°	3°
12	10°	10°	10°	9°	1°
13	7°	5°	2°	-1°	8°
14	21°	19°	18°	16°	5°
15	26°	25°	25°	24°	2°
16	0°	-1°	-2°	-3°	3°
17	13°	12°	12°	10°	3°
18	16°	16°	15°	13°	3°
19	15°	14°	14°	12°	3°
20	-4°	-4°	-4°	-5°	1°
21	18°	17°	17°	15°	3°
22	-8°	-8°	-9°	-9°	1°
23	23°	13°	6°	3°	20°
24	19°	12°	5°	2°	17°
25	25°	21°	18°	16°	9°
26	21°	13°	5°	2°	19°
27	13°	9°	4°	2°	11°
28	8°	5°	2°	0°	8°
29	19°	19°	17°	16°	3°
30	5°	1°	0°	-1°	6°
31	16°	11°	4°	1°	15°
32	15°	14°	13°	11°	4°
33	1°	-2°	-3°	-3°	4°
34	-6°	-6°	-5°	-6°	0°
35	14°	10°	3°	-1°	15°
36	12°	11°	10°	9°	3°
37	10°	10°	9°	8°	2°
38	-3°	-4°	-3°	-4°	1°
39	6°	4°	3°	1°	5°
40	10°	6°	5°	4°	6°

Table (17). Values of the patellar tilt angle in 40 cases of clinically diagnosed patellofemoral malalignment.

Case No	Degree	0°	15°	30°	45°
1		176°	167°	155°	144°
2		180°	172°	160°	149°
3		143°	136°	128°	120°
4		162°	154°	145°	137°
5		172°	168°	160°	157°
6		150°	140°	132°	126°
7		146°	138°	131°	125°
8		162°	157°	150°	142°
9		166°	160°	154°	149°
10		150°	142°	134°	127°
11		162°	157°	150°	142°
12		163°	156°	148°	140°
13		151°	145°	137°	129°
14		172°	164°	151°	143°
15		169°	160°	150°	142°
16		155°	148°	140°	133°
17		167°	159°	150°	142°
18		155°	148°	140°	133°
19		153°	145°	136°	128°
20		176°	167°	155°	144°
21		146°	137°	130°	125°
22		172°	164°	151°	143°
23		166°	156°	143°	131°
24		163°	151°	139°	127°
25		163°	155°	145°	133°
26		157°	146°	134°	123°
27		152°	140°	129°	120°
28		147°	135°	121°	110°
29		159°	147°	136°	125°
30		146°	132°	120°	111°
31		142°	130°	121°	114°
32		147°	138°	130°	123°
33		144	131°	120°	112°
34		150°	139°	127°	115°
35		155°	142°	128°	120°
36		140°	131°	123°	115°
37		151°	140°	128°	117°
38		160°	148°	135°	122°
39		162°	150°	140°	128°
40		168°	155°	143°	130°

Table (15). Values of the femoral trochlear angle in 40 cases of clinically diagnosed patellofemoral malalignment.

Parameters	Control gp.		Type I gp.		P value	Significance
	Mean	SD	Mean	SD		
CA in 0° knee flexion	2.1	7.7	22.2	6.4	P<0.001	Significant
CA in 15° knee flexion	-3	5.1	13.5	6.5		
CA in 30° knee flexion	-3	4.9	4	8		
CA in 45° knee flexion	-4	5.7	-2.5	7.9		
PTA in 0° knee flexion	18	9	18.7	5.5	p>0.05	Non Significant
PTA in 15° knee flexion	17	8	17.7	5		
PTA in 30° knee flexion	16	7	17.2	5		
PTA in 45° knee flexion	14	6.3	15.3	5.3		
Change in PTA	4	3.1	3.5	1.9	p>0.05	Non Significant
FTA in 0° knee flexion	150	8.7	157.3	9.8	P>0.05	Non Significant
FTA in 15° knee flexion	138	9.2	150	10		
FTA in 30° knee flexion	129	4.7	141.5	9.2		
FTA in 45° knee flexion	120	2.8	134	8.6		

Table 19. Correlation between control group and type I group.

Parameters	Control gp.		Type II gp.		P value	Significance
	Mean	SD	Mean	SD		
CA in 0° knee flexion	2.1	7.7	28.6	12	P<0.001	Significant
CA in 15° knee flexion	-3	5.1	18.3	12.5		
CA in 30° knee flexion	-3	4.9	10.6	12.7		
CA in 45° knee flexion	-4	5.7	3.5	12.5		
PTA in 0° knee flexion	18	9	2.1	6.9	P<0.001	Non Significant
PTA in 15° knee flexion	17	8	0.7	5.6		
PTA in 30° knee flexion	16	7	-0.8	4.8		
PTA in 45° knee flexion	14	6.3	-2.4	4		
Change in PTA	4	3.1	4.5	3	P<0.05	Significant
FTA in 0° knee flexion	150	8.7	166	10.9	P<0.02	Significant
FTA in 15° knee flexion	138	9.2	158.5	11		
FTA in 30° knee flexion	129	4.7	149	9.8		
FTA in 45° knee flexion	120	2.8	141	9.7		

Table 20. Correlation between control group and type II group.

Parameters	Control gp.		Type III gp.		P value	Significance
	Mean	SD	Mean	SD		
CA in 0° knee flexion	2.1	7.7	2.6	6.6	P>0.05	Non Significant
CA in 15° knee flexion	-3	5.1	-2	5.3		
CA in 30° knee flexion	-3	4.9	-3.4	5		
CA in 45° knee flexion	-4	5.7	-3.7	5.6		
PTA in 0° knee flexion	18	9	9.7	9	P<0.001	Significant
PTA in 15° knee flexion	17	8	5.5	6.5		
PTA in 30° knee flexion	16	7	2	3.6		
PTA in 45° knee flexion	14	6.3	0	2.9		
Change in PTA	4	3.1	9.7	6.8	P<0.01	Significant
FTA in 0° knee flexion	150	8.7	154.7	8.6	P>0.05	Non Significant
FTA in 15° knee flexion	138	9.2	142.6	9		
FTA in 30° knee flexion	129	4.7	130.7	8.7		
FTA in 45° knee flexion	120	2.8	120	7.3		

Table 21. Correlation between control group and type III group.

Parameters	Control gp.		Recurrent gp.		P value	Significance
	Mean	SD	Mean	SD		
CA in 0° knee flexion	2.1	7.7	25.7	8.9	P<0.001	Significant
CA in 15° knee flexion	-3	5.1	16	9.3		
CA in 30° knee flexion	-3	4.9	7.8	11.3		
CA in 45° knee flexion	-4	5.7	0.5	11.7		
PTA in 0° knee flexion	18	9	13	12	P<0.001	Significant
PTA in 15° knee flexion	17	8	11.5	11.5		
PTA in 30° knee flexion	16	7	10.5	11.6		
PTA in 45° knee flexion	14	6.3	8.5	11.6		
Change in PTA	4	3.1	4.6	3	P<0.01	Significant
FTA in 0° knee flexion	150	8.7	169.8	6.4	P<0.03	Significant
FTA in 15° knee flexion	138	9.2	163	5.5		
FTA in 30° knee flexion	129	4.7	153.7	4.3		
FTA in 45° knee flexion	120	2.8	146	5.3		

Table 22. Correlation between control group and recurrent group.

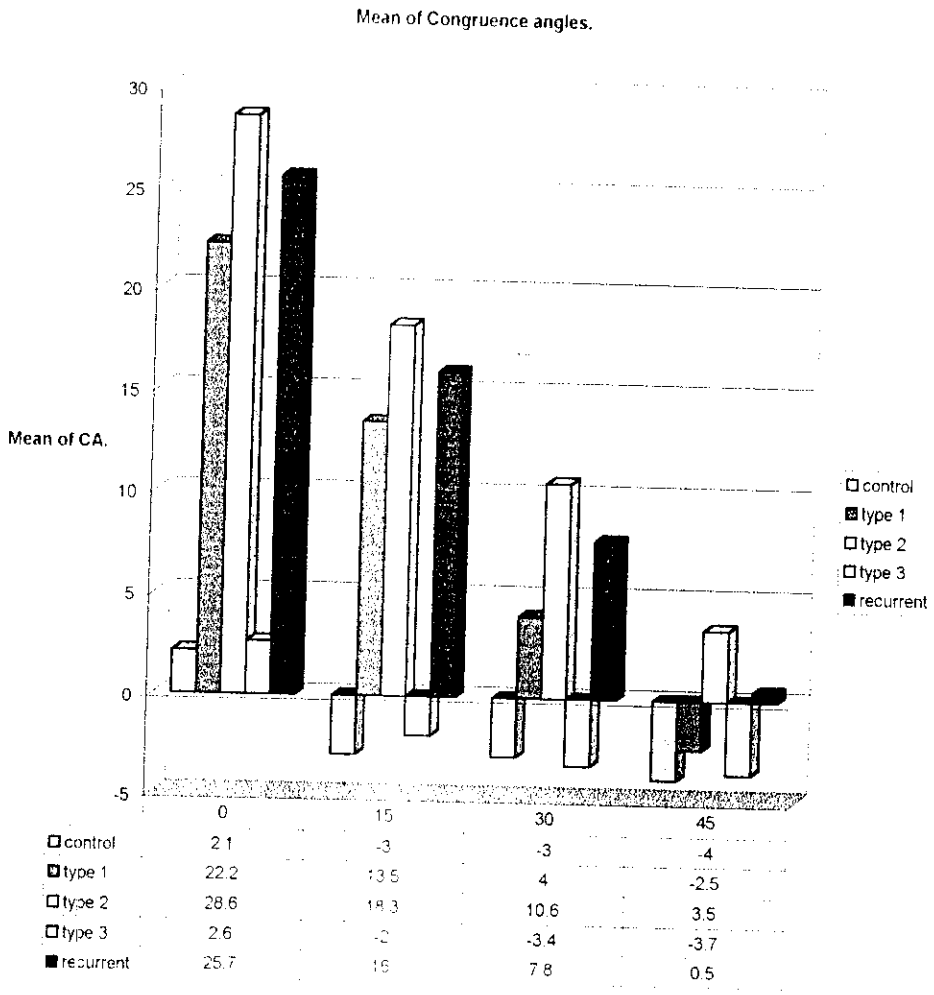
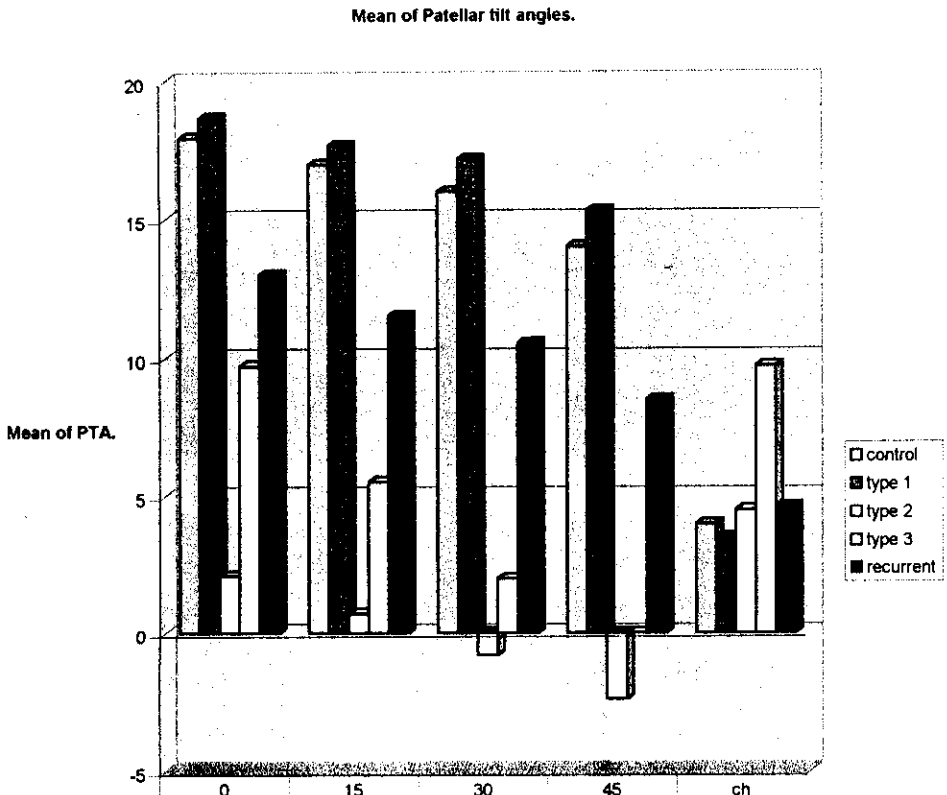
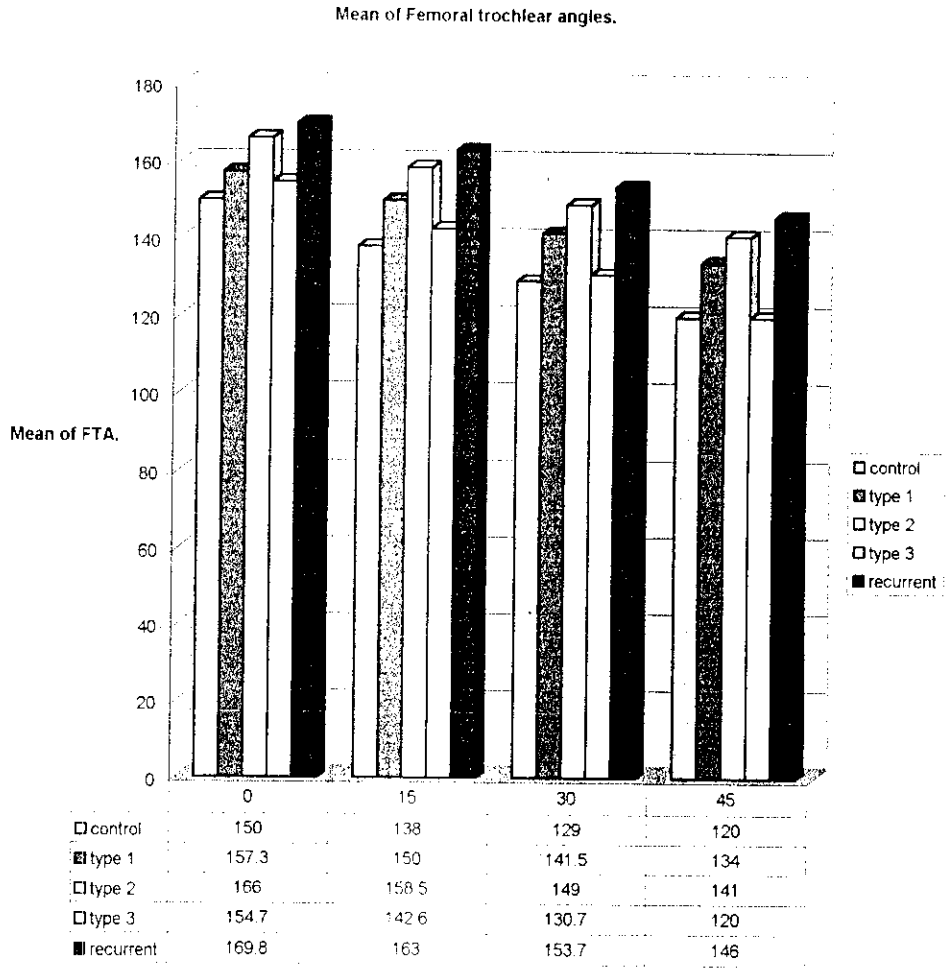


Figure (1). Mean of the Congruence angles is plotted against the variable degrees of knee flexion in controls, type I, Type II, type III cases and cases of recurrent patellofemoral malalignment.



	0	15	30	45	ch
control	18	17	16	14	4
type 1	18.7	17.7	17.2	15.3	3.5
type 2	2.1	0.7	-0.8	-2.4	4.5
type 3	9.7	5.5	2	0	9.7
recurrent	13	11.5	10.5	8.5	4.6

Figure (2). Mean of the Patellar tilt angles is plotted againest the variable degrees of knee flexion in controls, type I, Type II, type III cases and cases of recurrent patellofemoral malalignment.



	0	15	30	45
control	150	138	129	120
type 1	157.3	150	141.5	134
type 2	166	158.5	149	141
type 3	154.7	142.6	130.7	120
recurrent	169.8	163	153.7	146

Figure (3). Mean of the Femoral trochlear angles is plotted againest the variable degrees of knee flexion in controls, type I, Type II, type III cases and cases of recurrent pateflofemoral malalignment.

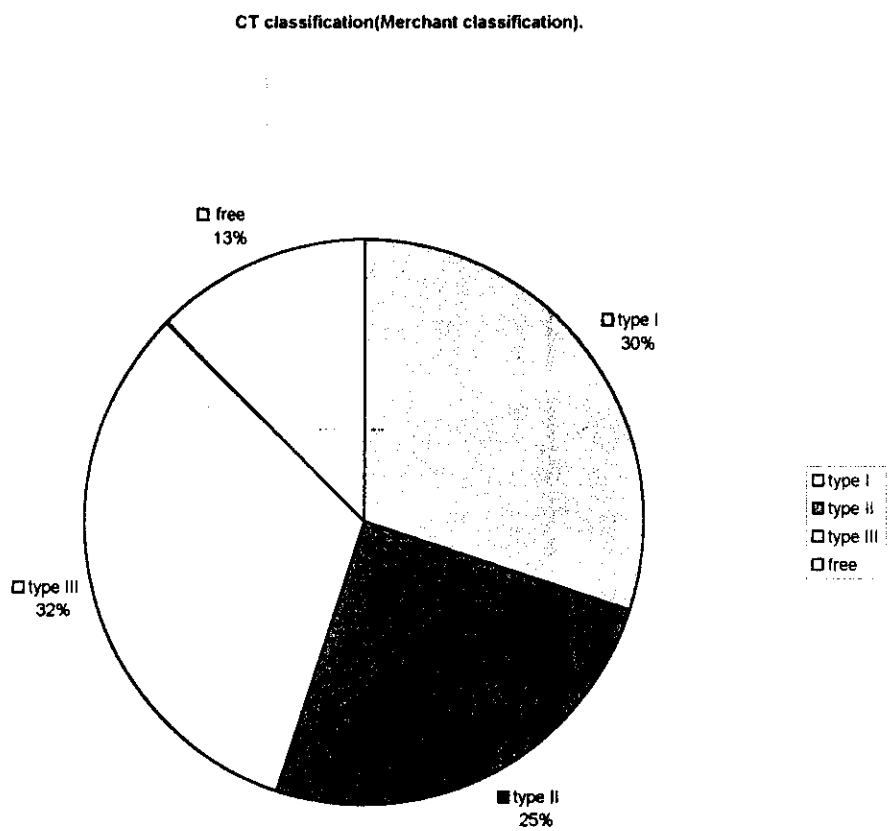


Figure (4). CT classification (Merchant classification) of 40 cases of clinically diagnosed patellofemoral malalignment.