Original Research

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# The correlation between Q-angle (clinical) and TTTG distance (axial computed thomography) in Firuzgar Hospital, 2008

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## Abstract

**Background:** The purpose of this study was to evaluate the significance of the Q angle with respect to the patella position. We assess the correlation between the Q angles (calculated by clinical exam) in different positions and CT indices (with more impression on TTTG)

**Method**: A total number of 68 knee joints of 50 cases entered the study. Clinical examination was used to measure Q angle (in 3 positions of sitting, standing and supine). CT scan performed in 2 axial view of proximal tibia, and distal femor for measurement of Tibial tuberosity-trochlear groove distance (TTTG) and other CT indices. Correlation between main variables calculated.and analysed with spss.

**Results**: Supine Q angle were strongly correlated with standing Q angles and moderately with sitting Q angle. Sitting Q angle was moderately correlated with supine and standing Q angle and weakly with PTA. we found no other significant correlation between Q angle and CT indexes.

**Discussion:** Our findings suggest that Q angle is not a valuable index for predicting the presence of patelofemoral malalignment.

**Keywords:** Q angle, TTTG. CT scan, patellofemoral malalignment, anterior knee pain.

## Introduction

Patellofemoral joint problems or Patellofemoral pain syndrome (PFPS) are one of the most frequent complaints in orthopedics and sports medicine. Clinically, its main symptoms are pain and instability, or pseudolocking, or both [1]. Abnormal patella alignment is described to be one of the extrinsic factors that can cause such pain. An exact determination of patellar alignment or malalignment does not exist, but would be necessary.

Nevertheless, a common tool to assess malalignment is the Q angle. An abnormal or increased Q angle is considered a relevant pathologic factor in patellofemoral disorders [2]. Many authors use a so called 'pathologic' Q angle (measured in extension) as an indication for medial transposition of the tibial tuberoses. But the Q angle varies depending on whether the patient's knee is in an extended or flexed position, whether the quadriceps muscle is relaxed or contracted, whether it is a woman or a man, and whether the position is supine or standing. Clinical findings and measurements

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of the Q angle only in extension may be elusive in many cases. Scientific proof is needed to indicate that an abnormal Q angle correlates with patellofemoral malalignment [2,3].

The quadriceps (Q) angle is a measure of the patella's tendency to move laterally when the quadriceps muscles are contracted. This is defined as the acute angle formed by a line connecting the anterior superior iliac spine to the center of the patella and a line connecting the center of the patella to the tibial tuberosity. The Q angle is increased in patients with a lateralized tibial tuberosity, but it can be falsely normal when the patella is laterally displaced. Different values for the normal ranges of the Q angle have been reported in the literature, and slight differences are noted when men are compared with women, when the patient is assessed standing, and when the quadriceps are contracted. With the knee slightly flexed, a Q angle of greater than 20 degrees is considered to be abnormal. The Q angle is increased in only a small percentage of patients with patellar pain; as with other clinical signs, an abnormal value does not necessarily identify the source of pain nor should it be considered an indication for operative treatment [4).

Patellofemoral disorders can be categorized into five types;

(a) Patellar instability with dislocation or subluxation associated with trochlear dysplasia

(b) Patellar instability with dislocation or subluxation associated without trochlear dysplasia

(c) Patellofemoral pain syndrome without dislocation, associated with trochlear dysplasia

(d) Patellofemoral pain syndrome without anatomical abnormalities

(e) Isolated patellofemoral arthritis [5].

Several radiographic measurements have been used in the investigation of abnormalities of the patellofemoral joint, including congruence angle, lateral patellofemoral angle and other indexes. The diagnostic value of studies based on axial roentgenograms is, however, limited by the fact that it is difficult to accurately image the patellofemoral joint in less than 30° of flexion [6].

The great sensitivity and specificity of computed tomography (CT) in the diagnosis of the patellofemoral relationship have been demonstrated by different authors [2.7].

One of the anatomically relevant factors for these disorders is a lateralized tibial tuberosity, or a medialised trochlear groove in the case of trochlear dysplasia. Bland first described the measurement of the distance between tibial tuberosity and the trochlear groove (TTTG) [7].

This measurement is obtained from CT scanning and is abnormal in 56-93% of cases with patellar instability and nearly all cases with trochlear dysplasia. An excessive TTTG can be used as the indication for a distal realignment procedure such as medialising the tibial tubercle. [2,7]. The great sensitivity and specificity of computed tomography (CT) in the diagnosis of the patellofemoral relationship have been demonstrated by different authors [2,4,5].

According to published articles malalignment is necessary to produce pain however; it is not solely enough for producing it and can be found in several cases with anterior knee pain that lacks malalignment. In this study without considering the presence of pain in our cases, we assess the correlation between the Q angle (calculated by clinical exam) in different positions and CT indices (with more impression on TTTG).

*Q angle (clinical assessment, supine):* this angle is represented by the intersection of a line drawn from the anterior superior iliac spine to the center of the patella with a second line drawn from the center of the tibial tuberosity to the center of the patella (Fig. 1). For this measurement to be accurate, the patella must be centered on the trochlea by flexing the knee 30 degrees. In males, the Q angle normally should be 8 to 10 degrees; in females, the normal angle is 15 degrees ± 5 degrees [2]. Insall's recommendation of 20° as an upper limit for a normal Q


MJIRI.Vol. 23, No.4, February, 2010. pp. 189-199

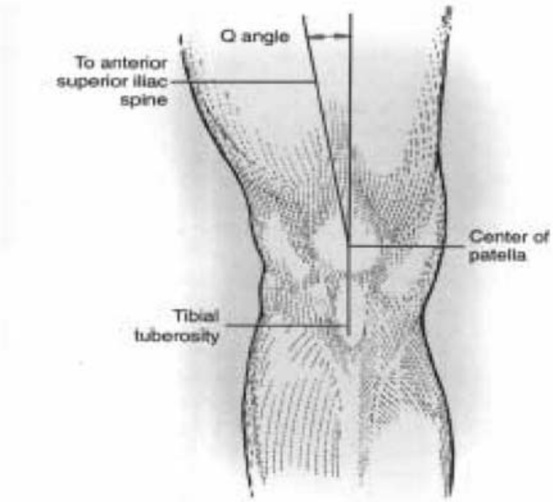



Fig. 1. Measurement of Q angle in supine.

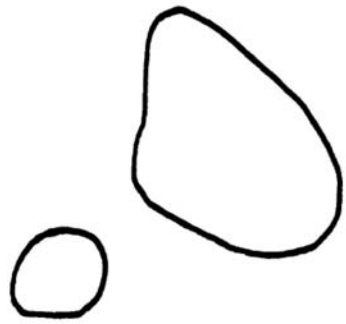


Fig. 2. The upper end of the anterior tibial tuberosity.

angle has been widely quoted. Females subjects generally have greater Q angle [11].

*The Q angel (clinical assessment, standing);* measuring method is the same as supine but in the standing position.

*The Q angel (clinical assessment, sitting);* is-the Q angle when the patient sited on the edge of the examination table with the knee at 90 degrees of flexion. The angle is formed by a line drawn from the center of the patella to the center of the tibial tuberosity and a line drawn from the center of the patella and passing perpendicular to the transepicondylar axis. This angle should be 0 degrees, and more than 10 degrees is definitely abnormal. This index may called "tubercle sulcus angle" or "the 90°Q angle".The average value for this index is 4.3° among asymptomatic subjects but did not report data on standard deviation.

*Tibial tuberosity-trochlear groove distance (TTTG):* The distance between the upper end of the anterior tibial tuberosity (Fig. 2) and the trochlear groove (Fig. 3). The perpendicular lines from the anterior tibial tuberosity and the trochlear groove are drawn (Fig. 4). Their dis-

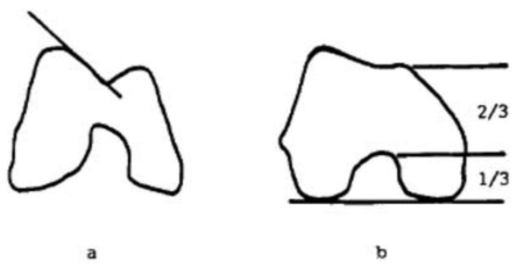



Fig. 3. The central midtrochlear region is identified by the Roman arch appearance of the intercondylar groove. The apex of the Roman arch should not normally lie beyond 1/3 of this region.

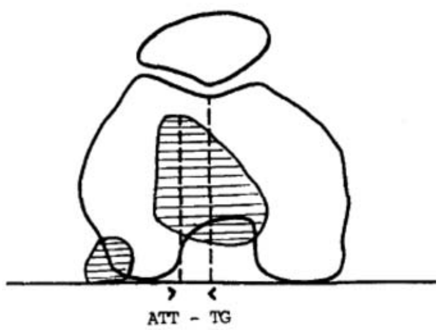



Fig. 4. The distance between the anterior tibial tuberosity and the trochlear groove results from the external position of the anterior tibial tuberosity and external knee rotation. Its average value is 10 to 12 mm. A clinical picture of anterior knee pain coupled with a value >20 mm should prompt surgical treatment to restore a normal Q angle.

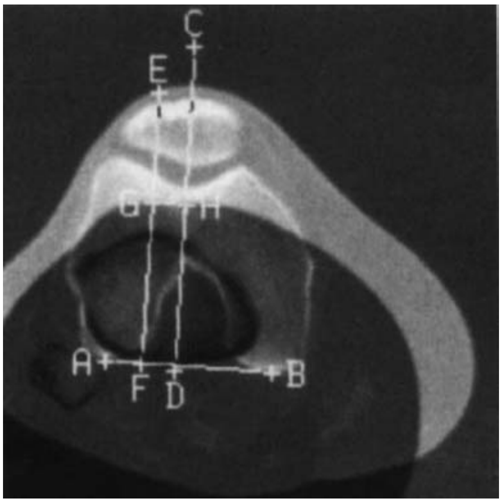



Fig. 5. Lines used to calculate tibial tubercle lateralization using CT. Line is drawn on superimposed image between posterior margins of femoral condyles (A-B). Two lines arc drawn perpendicular to this, one bisecting femoral trochlear groove (C-D), and one bisecting anterior tibial tuberosity through chosen point in center of patellar tendon insertion (E-F). Distance between these two lines (G-H) is measured in millimeters.

tance is measured in millimeters, and results from the external position of the anterior tibial tuberosity and external knee rotation.

The normal value of the anterior tibial tuberosity trochlear groove distance is 10 to I2 mm, with an average radiographic error of 54 mm." Anterior knee pain coupled with an anterior tibial tuberosity trochlear groove distance >20 mm should prompt surgical treatment,"

Patellar tilt angle (PTA): it represents lateral patellar tilt and the measurement is as follows: The patellar tilt angle, as described by Schutzer

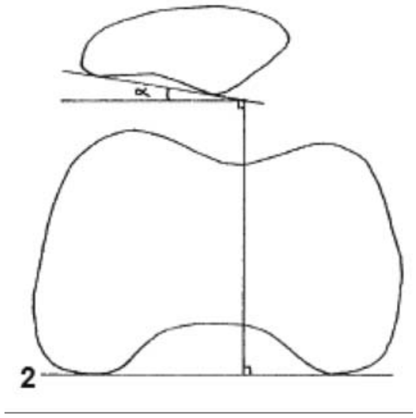



Fig 6. Measurement of the patellar tilt angle (alpha), as described by Schutzer, Ramsby and Fulkerson.

[6].

Ramsby and Fulkerson (Fig. 6) requires reference to the posterior margins of the femoral condyle with the same patellar reference. It has been suggested that reference to the posterior margins of the femur is more reliable as patients with patellofemoral pain may have a hypoplastic lateral femoral condyle. Its average value is 8.7±3.1°.

*Congruence angle as described by Merchant (CAM):* it represents lateral patellar shift. This angle relies on correct measurement of the sulcus angle. (Fig 7). Average value is -8° (±6).

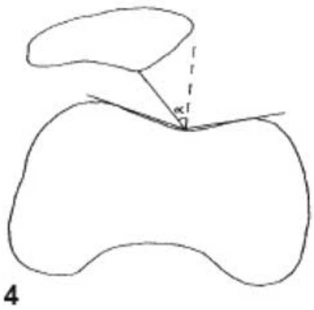



Fig. 7. Measurement of the congruence angle (alpha), as described by Merchant et al.

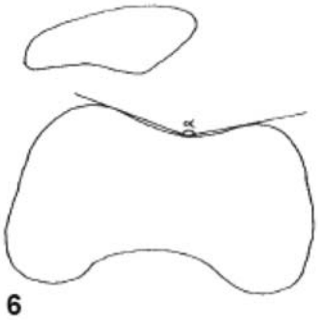



Fig. 8. Measurement of the femoral trochlear angle (sulcus angle)(alpha), as described by Schutzer, Ramsby and Fulkerson

*Sulcus angle:* it represents trochlear dysplasia. Average value is 137° (±6).

The patellofemoral pain syndrome (PFPS) represents a common significant problem for the clinician with regard to diagnosis and treatment. Abnormal patella alignment is described to be one of the extrinsic factors that can cause such pain. An exact determination of patellar alignment or malalignment does not exist, but would be necessary [2,6].

The Quadriceps or Q-angle was initially described by Brattstro¨m. It is an index of the vector for the combined pull of the extensor mechanisms and the patellar tendon. It is measured by drawing a line from the anterosuperior iliac spine to the centre of the patella, and a second line from the centre of the tibial tubercle to the centre of the patella. The angle where these lines intersect is regarded as the Q-angle. Traditionally, the Q-angle has been measured with subjects in supine, knee extended and with the quadriceps muscle relaxed. This is regarded as the 'traditional' or 'conventional' method of assessing Q-angle. The Q-angle has also been assessed on standing. The Q-angle measurement is widely used as an indicator of patellofemoral dysfunction, including patellofemoral pain syndrome (PFPS) and patella instability [2,7].

In males, the Q angle normally should be 8 to 10 degrees; in females, the normal angle is 15 degrees ± 5 degrees. This valgus angle gives a lateral force vector to the patellofemoral joint as the knee is extended. The vectors that can increase this Q angle are genu valgum, increased femoral anteversion, external tibial torsion, a laterally positioned tibial tuberosity, and a tight lateral retinaculum. The Q angle also can be increased in a dynamic mode by internally rotating the femur on a fixed tibia, as in a "cutting" maneuver. Any of these factors that increase the Q angle can be a contributing factor in recurrent patellar dislocation [1,2,3,8 ,]

The Q angle is increased in patients with a lateralized tibial tuberosity, but it can be falsely normal when the patella is laterally displaced.

| Author | Sex/Q angle | No Knees/age |
|---|---|---|
| Insall | 14° | 50/NS |
| Aglietti | F17°±3 | 75/23 |
| | M14°±3 | 75/23 |
| Hsu | F18.8°±4.7 | 60/NS |
| | M15,6±3.5 | 60/NS |
| Woodland | F15.8°±.072 | 57/20.0 |
| | M12.7±.072 | 69/22.3 |
| Johansun | | |
| At 0° | F15° | 100/47 |
| | M8.4° | 110/48 |
| at 45° | F7.6° | |
| | M7.6° | |
| At 90° | F5.4° | |
| | M5.4° | |
| Standing | | |
| Woodland | F17.0±.072° | 57/20 |
| | M13.6±.072° | 69/22.3 |
| Fairbank | F23±1.2° | 150/14.8 |
| | M20±1.2° | 150/14.8 |
| Horton | F15.8±4.5° | 50/22.6 |
| | M11.2±3.0° | 50/22.6 |

The great sensitivity and specificity of computed tomography (CT) in the diagnosis of the patellofemoral relationship have been demonstrated by different authors.

Different values for the normal ranges of the Q angle have been reported in the literature, and slight differences are noted when men are compared with women, when the patient is assessed standing, and when the quadriceps are contracted. With the knee slightly flexed, a Q angle of greater than 20 degrees is considered to be abnormal. The Q angle is increased in only a small percentage of patients with patellar pain; as with other clinical signs, an abnormal value does not necessarily identify the source of pain nor should it be considered an indication for operative treatment [10].

Scientific proof is needed to indicate that an abnormal Q angle correlates with patellofemoral malalignment. The great sensitivity and specificity of computed tomography (CT) in the diagnosis of the patellofemoral relationship have been demonstrated by different authors.

Computerized tomography can be used to superimpose images, as when the position of the tibial tuberosity is assessed relative to the trochlear groove. Tilting of the patella and other indexes can be evaluated.

A number of studies have, however, reported no such relationship between Q-angle and patellofemoral joint symptoms. Accordingly, measurement of the Q-angle has reduced in popularity amongst clinicians, as it does not inform on patient management [6,16].

Smith suggests that there is disagreement on the reliability and validity of the clinical Q-angle measurement. Inter-tester reliability ranged from an ICC of 0.20-0.70. Intra-tester reliability ICC ranged from 0.22 to 0.75. This variability may be due to the lack of standardization of measurement procedure or control of potential confounding variables.

There is some debate as to whether the Q-angle should be assessed in terminal extension or in 20°, 30° or 90° knee flexion. When the knee is flexed greater than 20°, the patellar is more centralised than in the zero degrees flexion where it is slightly lateralised.

By assessing in some degree of flexion, this may reflect the gait stance phase better, where the patella will be located within the trochlea groove. Some degree of flexion is also more indicative of when PFPS patients experience their aggravating position of stair descent or sitting for prolonged period. Therefore, by assessing in some flexion, this may be regarded as more clinically meaningful than in terminal extension [6].

There is disagreement on the reliability and validity of the clinical Q angle measurement. This may be due to the variability in measurement procedure [6].

We used convenience method of sampling. Samples were gathered from orthopedic clinic or CT-Scan department of Firuzgar hospital in year 2008-2009. Samples were among 15-50 year-old persons (male or female) without considering presence of anterior knee pain.This study was observational analytic study.

Clinical examination was used to measure Q angle (in 3 positions previously defined) by a single orthopedic surgery senior resident.

The CT scan (Philips NEUVIZ multislice model, 2008) performed in 2 axial view of proximal tibia, and distal femor for measurement of the TTTG, other mentioned indices, and an alignment CT scan view were used for excluding the patients with anatomic deformity of lower limb.

The CT scans were done by a trained CT scan operators and stored in a digital file, and then by senior resident who was blinded for identification data measured data for the indices based on the stored code.

Data were collected and imported to computer. Using "SPSS for windows 11.5.0" software data were analyzed and correlation between main variables calculated.

## Method

With the mentioned method of sampling, samples selected.

Exclusion criteria:

-Previous history of trauma to lower limb

-History of fracture in lower limb

-Presence of any significant deformity of lower limb in clinical exam or radiologic alignment view findings.

Case's data gathered in datasheets. Clinical

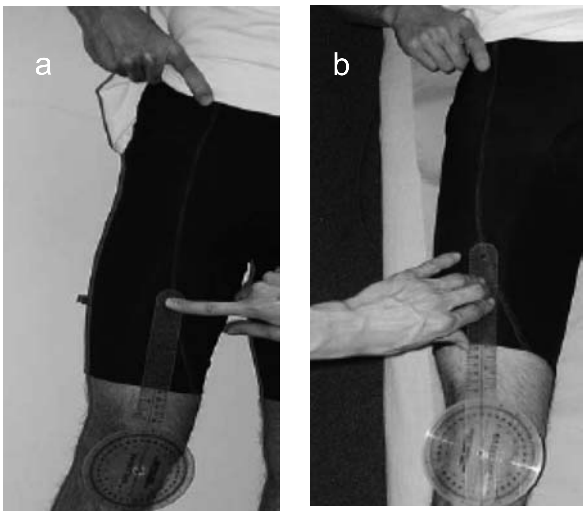



Fig. 9: Q-angle performed in standing (a) and supine (b)

| | Frequency | Percent |
|---|---|---|
| Female | 16 | 23.6 |
| Male | 52 | 76.4 |
| Total | 68 | 100.0 |

Table 1. Number of case based on gender.Table 1. Number of case based on gender.

| | Frequency | Percent | Cumulative Percent |
|---|---|---|---|
| Left | 29 | 42.6 | 46.8 |
| Right | 33 | 48.5 | 100.0 |
| Total | 62 | 91.2 | |
| System Missing | 6 | 8.8 | |
| Total | 68 | 100.0 | |

Table 2. Number of case based on side of knee,

examination was used to measure Q angle (in 3 positions previously defined) by a single orthopedic surgery senior resident with goniometer according to the mentioned standard method Figs. 9a, 9b.

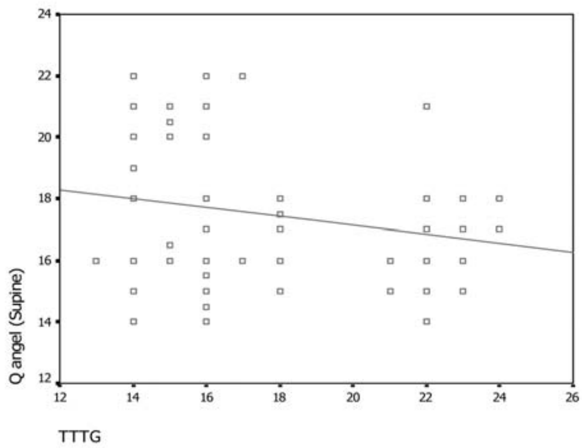
An alignment CT scan from femoral head to talar dome of ankle was performed as the first step for excluding the cases with deformity of lower limb. Then in full extension a cut of distal femor and proximal tibia performed to calculate TTTG and in the next step in 20° flexion, a mid patellar cut of distal femor for measuring PTA, CAM, Sulcus angle performed.

**Results**

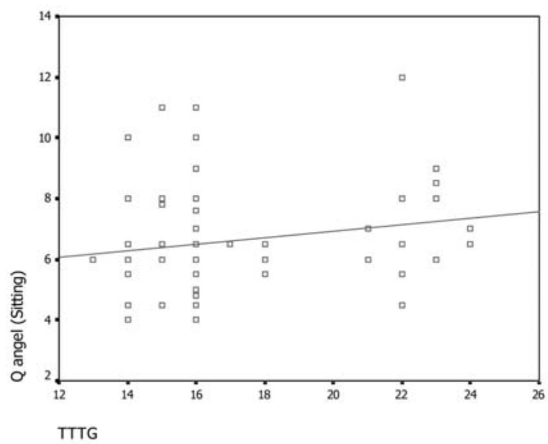
A total number of 68 knee joints of 50 cases entered the study. The mean (SD) of age were 30.8 [8.8) years. 16 (23.6%) cases were female and 52 (76.4%) cases male. 46.8% of samples were left knee and 53.2% right knee.

*Q angle measurement:*

Mean (±SD) Q angle were 17.5° (±2.5), 6.6° (±1.8) and 18.9° (±2.2) for supine, sitting and




Graph 1. Scatter plot of Q angle (supine) and TTTG




Graph 2. Scatter plot of Q angle (sitting) and TTTG

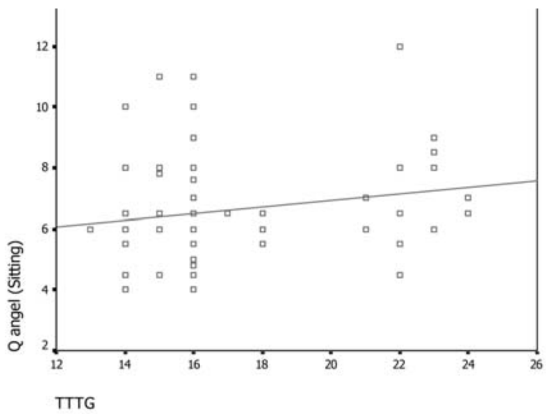
| | Q angel (Supine) | Q angel (Sitting) | Q angel (Standing) | TTTG | PTA | CAM | Sulcus angle | Age |
|---|---|---|---|---|---|---|---|---|
| Mean | 17.507 | 6.652 | 18.956 | 17.382 | 13.294 | -2.243 | 138.257 | 30.85 |
| Median | 16.750 | 6.000 | 18.000 | 16.000 | 12.000 | -2.000 | 138.000 | 29.50 |
| Std. Deviation | 2.5000 | 1.8027 | 2.2071 | 3.2417 | 2.8680 | 5.3855 | 6.0134 | 8.854 |
| Minimum | 14.0 | 4.0 | 16.0 | 13.0 | 8.0 | -14.0 | 128.0 | 18 |
| Maximum | 22.0 | 12.0 | 23.0 | 24.0 | 21.0 | 6.0 | 152.0 | 52 |

Table 3. Description of measured data.

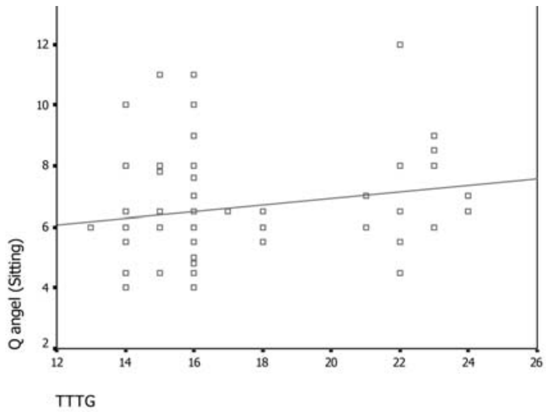
| | *Q angel (Supine)* | *Q angel (Sitting)* | *Q angel (Standing)* | *TTTG* | *PTA* | *CAM* | *Sulcus angle* | *Age* |
|---|---|---|---|---|---|---|---|---|
| Mean | 17.158 | 6.563 | 18.608 | 17.633 | 13.317 | -2.400 | 138.592 | 31.52 |
| Median | 16.000 | 6.000 | 18.000 | 16.000 | 12.000 | -3.000 | 138.000 | 29.50 |
| Std. Deviation | 2.4208 | 1.8126 | 2.0463 | 3.3444 | 2.9343 | 5.5805 | 6.2304 | 9.069 |
| Minimum | 14.0 | 4.0 | 16.0 | 13.0 | 8.0 | -14.0 | 128.0 | 18 |
| Maximum | 22.0 | 12.0 | 23.0 | 24.0 | 21.0 | 6.0 | 152.0 | 52 |

a Gender = Male

Table 4. Females description of measured data




Graph 3. Scatter plot of Q angle (Standing) and TTTG




Graph 4. Scatter plot of Q angle (Sitting) and PTA

standing position respectively.

*CT indexes:*

Mean (±SD) values for TTTG, PTA, CAM and Sulcus angle were 17.38 (±3.2), 13.29 (±2.8), -2.24 (±5.3) and 138.2 (±6.0) respectively. Similar data in males and females are shown in tables 4 and 5.

Distribution of measured indices were not normal so we used Spearman test for assessing the correlations.

The supine Q angle were strongly correlated with standing Q angles and moderately with sitting Q angle. However we found no significant correlation between Supine Q angle and CT indexes (Table 6).

The sitting Q angle was moderately correlated with supine and standing Q angle and weakly with PTA (Spearman rho=0.28).

The standing Q angle had no significant cor-

| | *Q angel (Supine)* | *Q angel (Sitting)* | *Q angel (Standing)* | *TTTG* | *PTA* | *CAM* | *Sulcus angle* | *Age* |
|---|---|---|---|---|---|---|---|---|
| Mean | 17.158 | 6.563 | 18.608 | 17.633 | 13.317 | -2.400 | 138.592 | 31.52 |
| Median | 16.000 | 6.000 | 18.000 | 16.000 | 12.000 | -3.000 | 138.000 | 29.50 |
| Std. Deviation | 2.4208 | 1.8126 | 2.0463 | 3.3444 | 2.9343 | 5.5805 | 6.2304 | 9.069 |
| Minimum | 14.0 | 4.0 | 16.0 | 13.0 | 8.0 | -14.0 | 128.0 | 18 |
| Maximum | 22.0 | 12.0 | 23.0 | 24.0 | 21.0 | 6.0 | 152.0 | 52 |

a Gender = Male

Table 5. Males description of measured data.

| | | *Q angel (Supine)* | *Q angel (Sitting)* | *Q angel (Standing)* | *TTTG* | *PTA* | *CAM* | *Sulcus angle* |
|---|---|---|---|---|---|---|---|---|
| Q angel (Supine) | Correlation Coefficient | 1.000 | .545(**) | .921(**) | -.090 | .133 | .096 | .029 |
| | Sig. (2-tailed) | - | .000 | .000 | .464 | .278 | .438 | .817 |
| | N | 68 | 67 | 68 | 68 | 68 | 68 | 68 |
| Q angel (Sitting) | Correlation Coefficient | .545(**) | 1.000 | .561(**) | .184 | .289(*) | -.194 | .205 |
| | Sig. (2-tailed) | .000 | - | .000 | .137 | .018 | .115 | .096 |
| | N | 67 | 67 | 67 | 67 | 67 | 67 | 67 |
| Q angel (Standing) | Correlation Coefficient | .921(**) | .561(**) | 1.000 | -.086 | .099 | .069 | -.028 |
| | Sig. (2-tailed) | .000 | .000 | - | .486 | .423 | .577 | .821 |
| | N | 68 | 67 | 68 | 68 | 68 | 68 | 68 |
| TTTG | Correlation Coefficient | -.090 | .184 | -.086 | 1.000 | .436(**) | -.504(**) | .631(**) |
| | Sig. (2-tailed) | .464 | .137 | .486 | - | .000 | .000 | .000 |
| | N | 68 | 67 | 68 | 68 | 68 | 68 | 68 |
| PTA | Correlation Coefficient | .133 | .289(*) | .099 | .436(**) | 1.000 | -.621(**) | .531(**) |
| | Sig. (2-tailed) | .278 | .018 | .423 | .000 | - | .000 | .000 |
| | N | 68 | 67 | 68 | 68 | 68 | 68 | 68 |
| CAM | Correlation Coefficient | .096 | -.194 | .069 | -.504(**) | -.621(**) | 1.000 | -.536(**) |
| | Sig. (2-tailed) | .438 | .115 | .577 | .000 | .000 | - | .000 |
| | N | 68 | 67 | 68 | 68 | 68 | 68 | 68 |
| Sulcus angle | Correlation Coefficient | .029 | .205 | -.028 | .631(**) | .531(**) | -.536(**) | 1.000 |
| | Sig. (2-tailed) | .817 | .096 | .821 | .000 | .000 | .000 | - |
| | N | 68 | 67 | 68 | 68 | 68 | 68 | 68 |

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Table 6. Correlation between Q angle and other indices

relation with any CT index.

The TTGT were significantly correlated with PTA, CAM and Sulcus angle. The intensity of correlation (Spearman Rho) was 0.43, 0.50 and 0.61 respectively. The PTA was also correlated with CAM and Sulcus angle (Spearman Rho 0.62 and 0.53 respectively). CAM and Sulcus angle were also correlated (Spearman Rho= -0.56) (Graph 1-4).

**Discussion**

Our results show that no correlation exists between the Q angle measured in supine, standing and sitting position and TTTG finding in CT scan. Although the Q angle has some value as an estimate of the degree of the theoretical skeletal malalignment, we agreed with Ford and Post and Dandy that it is an unreliable measurement for position of patella. There are many factors that increase or decrease the Q angle. The Q angle is increased with high femoral anteversion, genu valgum, external tibial torsion, laterally positioned tibial tuberosity, tight lateral retinaculum, pronated foot or deficiencies of the supporting muscles [4, 9]. A decreased Q angle is found in genu varum, medial subluxation of the patella after excessive lateral retinacular release, medialization of the tibial tuberosity over the midline of the trochlea, defective medial trochlea, and after excessive medial plication, especially if there is ligament laxity at the same time. This leads to the conclusion that both high and low Q angles should be considered as potential causes of patellofemoral problems.

Measurements of the Q angle have been reported even though the range of normal values is variable, and there are minimal quantifiable data supporting its diagnostic relevance. Some authors consider an abnormal Q angle as a relevant pathologic factor even without presenting values of what exactly is abnormal.

Recently, TTTG as a CT scan index has defined as a determining factor for diagnostic and treatment procedures of patella femoral instability [1,2,3,11]. According to the fact that presence of malalignment is necessary for producing pain but it is not the only factor has effect on knee pain, in this study we measured Q angle in 3 different ways and compared the measured values by CT scan indexes specially TTTG. Our findings suggested that Q angle was not a valuable index for predicting the presence of patellofemoral malalignment. Some authors considered Q angle values greater than 20° as abnormal and associated with patellofemoral problem [10]. However, we concluded that there was an immense controversy about how to measure the Q angle and its normal values. It is improper to draw the conclusion that an 'abnormal' Q angle is always an etiological factor for patellofemoral disorders and malalignment [11].

Some of the published articles have proved the fact that higher average value for Q angle is seen in patients with anterior knee pain; however it does not necessarily demonstrated that increased Q angle values automatically mean malalignment of the patellofemoral joint. It is therefore important to define the patient's symptoms as clearly as possible to document the patellofemoral relationship and the underlying pathology.

Evaluation of the patellofemoral joint using CT scans is precise and reproducible [12]. Kujala [11] and Biedert [2] demonstrated that the CT evaluation of the first 30° of knee flexion gives the most important information about the patellofemoral congruity.

## Conclusion

The anterior knee pain is a mult-factor problem that needs a complete assessment of lower limb. The diagnostic relevance of the Q angle could not be established in this study. Therefore we propose that clinicians use more precise CT Scan indices for evaluation of the patellofemoral malalignment.

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