

Original article:

An Observational Study to Evaluate the Q Angle in Different Static Postures: An Institutional Based Study

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ABSTRACT

Background: The Q angle, which is also known as quadriceps angle, is defined as the angle formed between the quadriceps muscles and the patella tendon. Hence, the present study was undertaken for evaluating the Q angle in different static postures.

Materials and Methods: A total of 20 male and 20 female volunteers were included in the present study. A master chart was framed and complete clinical and anatomical details of all the subjects were recorded. Calipers were used for assessing the point of the center of patella. Q angle were assessed. Placement of the volunteers in the supine position was done. After obtaining the images, the subjects were asked to maintain the position without rotation of the lower limbs. Hips were placed in neutral position with knees extended and relaxed ankle. Assessment of the Q angle was done in different position. All the results were recorded in Microsoft excel sheet and were analyzed by SPSS software. Chi- square test and unpaired t test were used for assessment of level of significance.

Results: Among males, significant results were obtained mean Q angle values at different positions. However; among females, the results were non-significant.

Conclusion: Measurement of the Q angle can be done in supine position without limb rotation.

Keywords: Posture, Quadriceps.

INTRODUCTION

The Q angle, which is also known as quadriceps angle, is defined as the angle formed between the quadriceps muscles and the patella tendon. It was described for the first time by Brattstrom in 1964. It is an evident medical fact that the measurement of the Q angle is a very decisive indicator of the biomechanical function in the lower extremity since this measurement reflects the effect of the quadriceps mechanism on the knee, it also gives an idea how the thigh muscles function to make the knee moves, as well as how the knee patella tracks in the groove of the knee joint.¹⁻³

Though bilateral differences in the Q angle have been documented, most studies done so far have concentrated on between-group rather than within-subject differences. Moderate to substantial amounts of bilateral asymmetry in the Q angle values when analyzed on an individual basis has been demonstrated. This has been attributed to bilateral asymmetry in the quadriceps muscle strength.⁴⁻⁶ Hence; under the light of above mentioned data, the present study was undertaken for evaluating the Q angle in different static postures.

MATERIALS AND METHODS

The present study was commenced with the aim of evaluating the Q angle in different static postures. Ethical approval was obtained from institutional ethical committee and written consent was obtained from all the patients after explaining in detail the entire research protocol. A total of 20 male and 20 female volunteers were included in the present study.

Inclusion criteria for the present study included:

- Subjects who gave the informed consent,
- Subjects with negative history of pathologic fractures of the lower limb
- Subjects with negative history of any muco-skeletal injuries in the lower limbs

Complete demographic details of all the subjects were obtained. A master chart was framed and complete clinical and anatomical details of all the subjects were recorded. Identification of the anatomical landmarks was done followed by assessment of captured images and photographic records. Bony prominences were demarcated using palpatory anatomy. Calipers were used for assessing the point of the center of patella. Q angle were assessed. Placement of the volunteers in the supine position was done. After obtaining the images, the subjects were asked to maintain the position without rotation of the lower limbs. Hips were placed in neutral position with knees extended and relaxed ankle. Assessment of the Q angle was done in different position. All the results were recorded in Microsoft excel sheet and were analyzed by SPSS software. Chi- square test and unpaired t test were used for assessment of level of significance.

RESULTS

In the present study, mean Q angle among males at lying parallel feet (LPF), lying abducted feet (LAF) and orthostatic abducted feet (OAF) was found to be 7.69, 8.56 and 7.88 respectively. Mean Q angle among females at lying parallel feet (LPF), lying abducted feet (LAF) and orthostatic abducted feet (OAF) was found to be 16.25, 15.99 and 16.02 respectively.

In the present study, among males, significant results were obtained mean Q angle values at different positions. However; among females, the results were non-significant.

Table 1: Descriptive analysis among males

Parameter	Mean	SD
LPF	7.69	6.12
LAF	8.56	6.85
OAF	7.88	7.11

LPF: Lying parallel feet, LAF: Lying abducted feet, OAF: Orthostatic abducted feet

Table 2: Descriptive analysis among females

Parameter	Mean	SD
LPF	16.25	7.85
LAF	15.99	6.45
OAF	16.02	7.41

LPF: Lying parallel feet, LAF: Lying abducted feet, OAF: Orthostatic abducted feet

Table 3: Comparison of mean values at different positions among males

Group comparison	p- value
LPF vs LAF	0.02 (Significant)
LPF vs OAF	0.82
LAF vs OAF	0.03 (Significant)

Table 4: Comparison of mean values at different positions among females

Group comparison	p- value
LPF vs LAF	0.28
LPF vs OAF	0.12
LAF vs OAF	0.82

DISCUSSION

The quadriceps angle, or Q angle is the angle formed by the meeting of two lines, one part of the anterior superior iliac spine (ASIS) and goes to the center of the patella, and another that goes from the tibial tuberosity to the center of patella. It is a clinical measure used to measure knee alignment with respect to the hip, femur and tibia, as well as evaluating the alignment of the patella. However, there is no universal acceptance of normal or abnormal Q angle due to the lack of a reliability coefficient and the different methods of measurement for this angle.⁵⁻⁸

In the present study, mean Q angle among males at lying parallel feet (LPF), lying abducted feet (LAF) and orthostatic abducted feet (OAF) was found to be 7.69, 8.56 and 7.88 respectively. Mean Q angle among females at lying parallel feet (LPF), lying abducted feet (LAF) and orthostatic abducted feet (OAF) was found to be 16.25, 15.99 and 16.02 respectively. Significant variation exists in relation to the values of Q angle by various researchers vary. It is well-known that the normal Q angle should fall between 12 and 20 degrees; the males are usually at the low end of this range; while females tend to have higher measurements. Other researchers' suggestions that the values should be as low as 10 degrees reflect problems. Recently, some studies have illustrated that values between 8° and 10° for men and up to 15° for women are deemed normal, but values which are higher than those can indicate an abnormality. Davies and Larson have not stated a range for normal values, but they regarded Q angles >20° as excessive.^{8,9}

In the present study, among males, significant results were obtained mean Q angle values at different positions. However; among females, the results were non-significant. Omololu BB et al established a baseline reference value for normal Q-angles among asymptomatic Nigerian adults. The Q-angles of the left and right knees were measured using a goniometer in 477 Nigerian adults (354 males; 123 females) in the supine and standing positions. The mean Q-angles for men were 10.7 degrees +/- 2.2 degrees in the supine position and 12.3 degrees +/- 2.2 degrees in the standing position in the right knee. The left knee Q-angles in men were 10.5 degrees +/- 2.6 degrees in the supine position and 11.7 degrees +/- 2.8 degrees in the standing position. In women, the mean Q-angles for the right knee were 21 degrees +/- 4.8 degrees in the supine position and 22.8 degrees +/- 4.7 degrees in the standing position. The mean Q-angles for the left knee in women were 20.9 degrees +/- 4.6 degrees in the supine position and 22.7 degrees +/- 4.6 degrees in the standing position. We observed a difference in Q-angles in the supine and standing positions for all participants. The Q-angle in adult Nigerian men is comparable to that of adult Caucasian men, but the Q-angle of Nigerian women is greater than that of their Caucasian counterparts.¹⁰ Woodland LH et al determined normal, mean quadriceps angles (Q angles) for college-aged men and women, and to compare Q angles measured in the supine and the standing positions. The Q angles of 269 men and 257 women were measured in both positions by use of a specially modified goniometer. The mean Q angle for men was 12.7 degrees in the supine position and 13.6 degrees in the standing position; for women the mean Q angle was 15.8 degrees in the supine position and 17.0 degrees in the standing position. All of these differences were statistically significant. They calculated the incidence of an abnormally high Q angle.¹¹

CONCLUSION

Under the light of above obtained results, the authors concluded that measurement of the Q angle can be done in supine position without limb rotation. However; further studies are recommended in further for better exploration of results.

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