

Reduce Q Angle To Increase Patient Health

By: Brian D. Jensen, D.C.



Knee pain and pain in close proximity to the knee are often treated successfully with the use of custom-made, flexible orthotics. Many chiropractors report that cases of patellofemoral pain syndrome often respond rapidly to orthotic support. This is probably due to the close relationship between the alignment of the foot and the function of the knee. Measuring the Q-angle provides objective information regarding the angulation of the patella as it tracks along the femoral groove.

The Q angle is a very important indicator of biomechanical function in the lower extremity. This measurement reflects the effect of the quadriceps mechanism on the knee (hence the "Q" angle). When assessed correctly, it supplies very useful information concerning the alignment of the pelvis, leg, and foot. Determination of the Q angle is particularly important for patients who are athletically active, both in competitive and recreational sports.¹ It is also necessary to measure this angle in female patients who walk for health or who climb stairs frequently. The effects of excessive pronation on the Q angle also deserve attention, since controlling foot pronation can often reduce the detrimental effects of an abnormal Q angle.

All About the Q Angle

Definition and procedure. The Q angle is the angle

between the quadriceps muscle (primarily the rectus femoris) and the patellar tendon. Determining the Q angle provides useful information regarding the alignment of the knee in the frontal plane. A measurement is made of the angle formed by the quadriceps muscle's pull from the pelvis to the patella, and the patellar tendon's pull on the tibia. Since large forces are transmitted through the patella during extension, misalignment will cause problems with knee function.

To measure the Q angle, start with the patient's knee and hip in extension, and the quadriceps muscle relaxed. Place the center axis of a long-arm goniometer over the center of the patella. Next, palpate the proximal tibia and align the lower goniometer arm along the patellar tendon to the tibial tubercle. Take the upper arm of the goniometer and point it directly at the anterior superior iliac spine (ASIS). The small angle measured by the goniometer is the Q angle.

Weightbearing position. Slight variations in patient positioning have a significant effect on the measurement of the Q angle, and measurement reliability in the supine position is only moderate.² Having the patient stand is the best way to obtain accurate information. This has the advantage of measuring the Q angle in the patient's usual upright posture, so that the normal weightbearing stresses are included. This means that additional valgus stresses on the knee and internal rotation forces due to excessive foot pronation are included in the measurement. Since we are most concerned with assessing how the knee functions during daily and sports activities, it certainly makes sense to obtain this important measurement while in a weightbearing position.



What's normal? When measured standing, the Q angle should fall between 18° and 22°.³ Males are usually at the low end of this range, while females (because of their wider pelvis) tend to have higher measurements. Post considers standing Q angles greater

than 25° in females and 20° in males to be abnormal.⁴ Rauh et al. assert that runners “with a Q-angle >20°” are “at 1.7 times greater risk of injury.”⁽¹⁾ When measured in the supine position, the values will be lower, and the normal range ends at 15° in males and 20° in females.⁵ Generally speaking, when it comes to the quadriceps angle, less is better than more.

How Higher Q Angles Can Affect the Body

Added stress. A Q angle measured at the higher end of the normal range indicates a tendency for added biomechanical stress during strenuous or repetitive activities using the knee. When the measurement is above the normal limits, the probability of developing knee joint symptoms increases rapidly. These problems are dependent on a number of factors, including habitual forces on the knee and other alignment abnormalities.

Microtrauma and degeneration. A high Q angle interferes

with the smooth movement of the patella in the femoral groove. Over time, and especially with sports activities and/or stair-climbing, this microtrauma causes a non-specific anterior knee pain. Patellofemoral pain syndrome, which according to Fredericson and Yoon accounts for 25% of all sports-related knee injuries⁶, develops when abnormal tracking continues, and causes muscle imbalance.⁷ Eventually, wearing away of the cartilage on the underside of the patella (chondromalacia patellae) and degeneration of the articular surfaces of the knee (DJD) is found. At this point, permanent damage has been done, and complete recovery is usually not possible.

Dysfunction and disease. Whenever a patient has excessive pronation of the foot, Q angle stresses are magnified. Prolonged time in pronation causes excessive internal rotation of the tibia, impeding its normal external rotation during gait progression in the stance phase.

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This excessive internal tibial rotation transmits abnormal forces upward in the kinetic chain and produces medial knee stresses, force vector changes of the quadriceps mechanism, and lateral tracking of the patella.⁸ The combination of a higher Q angle with excessive pronation causes a more rapid progression from knee dysfunction to patellofemoral arthralgia to degenerative joint disease.

Decreasing the Q Angle

Orthotic supports. The most effective way to decrease a high Q angle and to lower the biomechanical stresses on the knee joint is to prevent excessive pronation with custom-made, flexible orthotics.⁹ A 2002 study shows that Q angle asymmetries, secondary to excessive pronation affecting knee alignment, can be effectively controlled or corrected utilizing custom-made, flexible orthotics.¹⁰



Adjustments and exercises. While no adjustment has been reported to reduce the Q angle, a search for pelvic and knee misalignments should be part of care. It is important that good biomechanical function be restored to all joints of both lower extremities.

Improving muscle compliance and strengthening of weak areas should be included. The use of the Intracell Stick has been very effective in increasing muscle compliance and enhancing biomechanical function. Muscles commonly found to be tight include: quadriceps, hamstrings, iliotibial band, and gastrocnemius. The vastus medialis obliquus (VMO) is usually weaker than the opposing vastus lateralis muscle. Sometimes it is the coordination of these muscles that has become abnormal. Strengthening may require a special focus on the timing of muscle contractions. Closed chain exercises (such as wall squats) done only to 30° of flexion are currently recommended.¹¹ (footnotes available upon request)

About the Author

Dr. Brian Jensen graduated from Palmer College of Chiropractic in 1987. He speaks on a wide variety of topics, including orthotic therapy, posture, structural preservation, breaking free of the medical model of health care, and innovations in nutrition. Dr. Jensen is currently the Associate Director of Professional Education at Foot Levellers, Inc.



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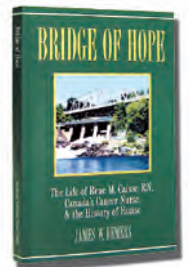
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