CASE REPORT

Patellofemoral Pain Syndrome in Tibetan Buddhist Monks

Michael Stephen Koehle, MD

From the Allan McGavin Sport Medicine Centre, Department of Family Practice and School of Human Kinetics, University of British Columbia, Vancouver, British Columbia, Canada, and the Himalayan Rescue Association, Kathmandu, Nepal.

Patellofemoral pain syndrome is a common diagnosis in athletes and especially runners. This article discusses 3 cases of patellofemoral pain caused by pronounced inactivity and prolonged knee hyperflexion at altitude in a unique population of Tibetan Buddhist monks. In this case, the monks responded well to a program of activity modification and exercises.

Key words: patellofemoral syndrome, altitude, injuries, occupational diseases

Patellofemoral pain syndrome is an extremely common condition affecting both athletes and nonathletes.¹ The pain is typically multifactorial in etiology. From a group of Tibetan Buddhist monks, we report 3 cases related to disuse atrophy, prolonged sitting in a challenging position, and possibly environmental factors.

Cases

Three young monks presented with anterior knee pain during a home visit by the local volunteer physician. These monks were approximately 6 months into a 3-year term in a remote monastery, or *gompa*, in the Nepal Himalaya. The 2-storied gompa was located at an elevation of 3600 m, and the monks were unable to leave it during their term. They were not allowed any contact with outsiders (other than the physician).

The monks were men of Tibeto-Burman descent aged 20, 21, and 29 years. None of them had a past history of knee pain or knee trauma. They complained of bilateral anterior knee pain of 2 to 3 week's duration. The 21-year-old monk felt the pain much more on the left side. The pain was made worse by sitting in the lotus position, which entails having the legs crossed such that the feet rest on top of the knees, not below the knees as in a standard cross-legged pose (see Figure). The 29-

year-old monk had difficulty sleeping at night because of the pain. He found that the pain was worse earlier in the day and in colder weather. All 3 monks had pain with squatting and long periods of sitting in the lotus position.

The monks followed a very strict daily schedule. They slept in the lotus position from 2230 hours until 0300 hours. They had 4 chanting sessions per day performed in the lotus position, with each session lasting 2½ to 3 hours. They undertook their own activities of daily living, but instrumental activities of daily living (eg, cooking, errands) were performed by junior monks. The cloistered monks were primarily confined to the second floor of the gompa, very rarely traveling up and down a ladder between the 2 floors. For footwear, they wore plain “thong” sandals. The monks followed a very simple vegetarian diet (main protein sources were dairy and legumes). They had no other significant medical problems.

On examination, each monk had relatively neutral lower-limb alignment. The 21-year-old had mild genu valgus. There were no significant abnormalities of foot alignment and gait. There was no asymmetry of muscle bulk, though all 3 monks had poorly developed thigh musculature.

Knee examination in all 3 monks demonstrated no abnormalities to inspection. Passive range of motion was full and pain free. There were no effusions. Joint line tenderness was absent. Ligament testing was normal, as was the McMurray test. All 3 monks had retropatellar tenderness and crepitus, and apprehension test and pa-

Corresponding author: Michael Stephen Koehle, MD, Allan McGavin Sport Medicine Centre, Department of Family Practice and School of Human Kinetics, University of British Columbia, 3055 Westbrook Mall, Vancouver, BC V6T 1Z3, Canada (e-mail: Michael.Koehle@gmail.com).

In the lotus position, the right foot is placed on the left thigh and the left foot is placed on the right thigh with the soles of the feet turned up and the spine straight.

tellar mobility were normal. Hip abductor power was found to be very weak, and Ober tests for iliotibial band tightness were normal.

Investigations were impractical because of the remote location of the clinic and the monks' vows.

The monks were asked to sleep and chant with legs

crossed instead of in the lotus position. Each monk was prescribed 2 strength exercises: a wall squat and side leg raises (3 sets of 10 repetitions each). They were also prescribed some simple quadriceps stretches and were encouraged to walk around the inside of the gompa as much as possible.

A follow-up visit occurred at approximately 4 weeks. All 3 monks felt significantly better. The 2 younger monks were now pain free, and the oldest had very mild discomfort. He was now able to sleep at night.

Discussion

Patellofemoral pain syndrome is multifactorial and has been attributed to muscle dysfunction, malalignment,¹ or a combination of both. Malalignment was present in only 1 patient and only to a very mild degree. Muscle dysfunction can be caused by inflexibility, neuromuscular dysfunction, or muscle weakness. Weakness in both the quadriceps^{2,3} and the hip abductors^{4,5} has been postulated to contribute to patellofemoral pain syndrome. The monks in this case report demonstrated 2 possible interrelated risk factors for weakness: disuse and chronic hypoxia.

When the monks moved to the gompa, they experienced a profound decrease in their activity level, causing muscle weakness through disuse. Inactivity has also been shown to impair knee joint proprioception,⁶ another contributor to patellofemoral pain syndrome.⁷ The monks also began spending up to 16 hours per day in the lotus position. In this position, the knees are flexed between 100 and 115 degrees. This position also causes increased external tibial rotation and varus stress. Such a prolonged posture may have also put extra stress on the patellofemoral joint. There is no literature on the lotus position and knee function, but such a position is likely a modified variant on the “theater” sign, putting more force on the proximal and lateral patellofemoral joints. Switching to a standard cross-legged position would have reduced the external tibial torsion and the contact pressure on the injured area.

The altitude of the gompa may have played a role in the monks’ pathogenesis. Muscle loss at altitude has been reported at altitudes above 5000 m⁸ but in more active individuals. These monks resided at 3600 m, but they were also much less active than the climbers who are typically studied at the higher altitudes. The monks’ resting arterial oxygen saturation would have been similar to other residents of the community (approximately 88%). This chronic hypoxia, combined with the profound inactivity, may have accelerated the monks’ disuse atrophy.

These individuals had no background in exercise

training, so the prescribed exercise protocol was designed to be as simple as possible without using equipment. Their symptomatic improvement was surprisingly rapid and may relate to the brevity of their condition before presentation.

Conclusion

These cases represent a unique combination of sudden inactivity, moderate altitude, and prolonged hyperflexion causing patellofemoral pain syndrome, which responded to exercise prescription and activity modification.

Acknowledgments

The author would like to acknowledge the support of Dr Wendy Cook, Dr Rob Lloyd-Smith, the Natural Sciences and Engineering Research Council, the Wilderness Medical Society, and the Michael Smith Foundation for Health Research.

References

1. Witvrouw E, Werner S, Mikkelsen C, Van Tiggelen D, Vanden Berghe L, Cerulli G. Clinical classification of patellofemoral pain syndrome: guidelines for non-operative treatment. *Knee Surg Sports Traumatol Arthrosc.* 2005;13:122–130.
2. Owings TM, Grabiner MD. Motor control of the vastus medialis oblique and vastus lateralis muscles is disrupted during eccentric contractions in subjects with patellofemoral pain. *Am J Sports Med.* 2002;30:483–487.
3. Callaghan MJ, Oldham JA. Quadriceps atrophy: to what extent does it exist in patellofemoral pain syndrome? *Br J Sports Med.* 2004;38:295–299.
4. Niemuth PE, Johnson RJ, Myers MJ, Thieman TJ. Hip muscle weakness and overuse injuries in recreational runners. *Clin J Sport Med.* 2005;15:14–21.
5. Ireland ML, Willson JD, Ballantyne BT, Davis IM. Hip strength in females with and without patellofemoral pain. *J Orthop Sports Phys Ther.* 2003;33:671–676.
6. Petrella RJ, Lattanzio PJ, Nelson MG. Effect of age and activity on knee joint proprioception. *Am J Phys Med Rehabil.* 1997;76:235–241.
7. Baker V, Bennell K, Stillman B, Cowan S, Crossley K. Abnormal knee joint position sense in individuals with patellofemoral pain syndrome. *J Orthop Res.* 2002;20:208–214.
8. Tschoop M, Morrison KM. Weight loss at high altitude. *Adv Exp Med Biol.* 2001;502:237–247.