



IFSSH Scientific Committee on Musician's Hand

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As musicians require quite specific hand movements for performance, hand afflictions are a serious problem for their professional career. Some physicians noticed the problems in 19th century, and Poore reported the hand pain of professional pianists in 1887 (1).

However, there have been few medical reports concerning the musician's health until the 1980's (2, 3, 4, 5, 6). In addition, medical conferences focusing on musicians were organised, such as the Performing Arts Medicine Association (PAMA) symposium, and the European Congress for Musician's Medicine (ECMM). However, as there were few hand surgeons participating, the discussions on the musician's hand could not include causes and management in detail.

As the hand surgeon is a specialist of hand clinical matters, the discussion by the IFSSH members allows more specific and more relevant discussion to be focused on the musician's hand.

The musician's hand committee is composed of five IFSSH members and three advisers: Dr Kai-Nan An as an adviser for the biomechanics; Dr. Richard C. Lederman and Dr. Eckart Altenmueller as advisers for the focal dystonia.

Background of the musician's hand

1. New criteria for musician's hand

As the musician's hand has so many aspects, it brings many new concepts to the world of general hand surgery. Certainly, there are not so many professional musicians, but understandably the treatment of the musician's hand may be a key to open the door to alternative methods of assessment and treatment of other conditions by hand surgeons.

For example, most criteria for the clinical results include only static evaluation such as range of motion, i.e. maximum and minimum flexion angle, grip or pinch strength. Radiological parameters also show only static positions. DASH tries to evaluate some hand activities, but is not detailed enough to evaluate the musician's hand activity. Many musicians require a quick speedy movement of their fingers which cannot be evaluated with any criteria so far published. Although the hand surgeon may be satisfied with the clinical result of a good score, some musician patients are not satisfied because they cannot do their performance quickly enough. This suggests that new criteria need to be established and these would be applicable not only to musicians, but for any other patients who needs a quick occupational hand motion such as the typist, cook, sculptor, or others.

2. Re-evaluation of conservative treatment

Another aspect of management of the musician's hand is a re-evaluation of non-surgical treatment to avoid surgical complications. Tenosynovial release is a simple, very easy surgical procedure and the result is usually good. However, some musicians complain of subluxation of tendons following this surgery, e.g. tendon bowing, as it brings a poor effect to their music performance. The 1st compartment release for de Quervain's disease may result in tendon subluxation when playing on the piano keyboard. Even small, minor surgery changes the physical structure and some of these could result in poor effect for the patient's hand activity. Similarly, carpal tunnel release may result in bowing of flexor tendons and a similar complaint may be found among string players. It also affects other occupational hand functions. Corticosteroid injection using triamsinolone gives an excellent result for any kind of tenosynovitis, and the injection technique has been proposed as providing a better result. However, corticosteroid has serious potential side effects including tendon rupture, and better injection material is expected. Amadio and colleagues have studied the excursion inside the tenosynovium, and clarified its structural mechanism (7).

Concerning non-surgical treatment, conditions such as carpal and cubital tunnel syndrome, osteoarthritis including the Heberden's node and 1st CMC joint arthrosis, and Dupuytren's contracture should be additionally discussed.

3. Practice for music performance

The third point is that musicians do not want to stop their practice for music performance. They complain that most physicians would firstly recommend a rest from practice. However, they need to consume several hours for music instrumental practice to maintain their performance technique. Otherwise they cannot complete the performance to the high, professional level which the audience expects. In order to maintain their performance technique level, to continue to practise, hand surgeons should consider what they can and what they cannot do. We may have to re-evaluate the after-treatment for an early return to stage. Minimally invasive or endoscopic surgery cannot resolve the problem. Discussion of problems of the musician's hand should be more directly related to kinematics of the human hand, and this would be appropriate not only for musicians, but for any other patients with hand problems.

4. Interface between the instrument and hand

The fourth point is that we hand surgeons should remember that the hand is always directly related to the object. Therefore, the man-machine interface between the hand and the object should be more closely considered with any hand problems. Music instruments often require musicians to adopt an unreasonable hand position or motion. Consider the unnatural hand position of the violinist or flautist. If instruments

were tools of daily use, they would have been totally changed in design from an ergonomic point of view. However, most music instruments cannot be changed and retain their unique tone. For example, string instruments have been unchanged for 300 years. Therefore, the musician's hand must adapt itself to the type of music instrument. The hand surgeon should consider not only the hand condition, but the interface between the hand and the music instrument. This is also so for general hand patients.

5. Psychosomatic factor of musicians

The fifth point is the psychosomatic factor of the musician's hand. Usually, musicians are nervous about their hand condition, because even small changes could create a serious problem or disability for their specific, music performance. This feature may often be related to a psychosomatic factor. Hand surgeons cannot avoid or underestimate the importance of a psychosomatic factor, because the hand is a mirror of brain activity.

6. Focal hand dystonia

Focal dystonia should also be discussed when assessing the problems confronting the musician's hand. This is a most difficult musician's disease to treat, and so serious for them as to cause them to give up their professional carrier. Dystonia should be discussed not only by hand surgeons, but by neurologists. I have asked two neurologists who are well known for musician's dystonia to contribute their thoughts.

Surgical indications for musicians

Among the discussion points on the musician's hand, surgical indication was thought to be one of the most important ones, because musicians sometimes have a specific need, in order to improve or maintain their performance activities, rather than simply undertake their daily living activities.

For example, with Dupuytren's contracture, some musicians with a small contracture need surgery, but in the others, especially some violinists, digital flexion contractures can exist with no functional loss even when joints are contracted to a degree where surgery is normally indicated. One violinist with a Dupuytren's contracture had difficulty in holding the string (Figure 1, Dr. Sakai's patient), but he was satisfied with the result of conservative treatment, even though the ring finger showed a limited range of motion (Figure 2).



Figure 1 (left): One of the violinists had difficulty in holding the string with Dupuytren's contracture.



Figure 2 (right): But he was satisfied with the result of conservative treatment. Even though the ring finger also showed a limited range of motion, he never wanted more improvement.

Concerning the surgical indication for musicians, Dr. Winspur offered a general comment as follows:

“Surgical indications, the analysis of the risks of surgery versus the benefits, differ in musicians from those in the general public. In some circumstances the indications are looser and in others much stricter and they may vary from instrument to instrument.”

Trauma

In the repair/reconstruction of an injury in a musician one must strive for 100% return of function and balance. This may mean a complex anatomical repair or reconstruction when a simpler compromise may be available. Simple examples would be the repair of very distal digital nerve lacerations or digital or cutaneous nerves on the less important aspects of digits. A further example would be the repair of an extensor tendon when the function of that tendon is reduplicated or of minor importance generally; or the secondary reconstruction of divided tendons by tendon grafting when the simpler option of tendon transfer or arthrodesis may be available and is known to work well in the general population. The indications therefore for anatomical repair are much greater in a musician than in the general population.

Non-trauma

In the simplest terms, if the medical condition is interfering with a musician playing at their own high level and all options of conservative care, adjustment of technique and adjustment of the instrument have been exhausted or are not applicable, surgery is

indicated. This may be at a later point than in the general population or earlier. An example would be Dupuytren's contracture which in the left hand in string players causes little interference with playing even with a contracture well past the point one would normally have recommended treatment. In these circumstances surgery should be withheld until playing is compromised. Conversely musicians requiring wide span – pianists and bassoon players are two examples – are compromised by very early disease in the palm without digital contracture and surgery or collagenase injection is indicated at this early point when not in the general population.

Nerve compression syndromes

The commonest operations performed on musicians electively are release of entrapped nerves particularly release of the carpal tunnel. However not all musicians suffering tingling in the fingers, even in the median distribution, have compression of the median nerve and this group fare very badly with inappropriate surgical release. The indication for surgical release of the carpal tunnel in a musician is interference with playing AND positive nerve conduction testing and this also applies to all other nerve compression syndromes amenable to nerve conduction testing.

Summary

Indications vary from musician to musician, from instrument to instrument and from medical condition to medical condition and are different from those in the general population. When a musician has injured structures from open or closed trauma anatomical reconstruction should be the goal even when not indicated in a non-musician. When a musician is suffering a non-traumatic condition, surgery is only indicated when all other modalities of treatment or adjustment have been exhausted and the condition prevents the musician from playing.

EPL rupture - Transfer or graft?

As the first topic of detailed committee discussion, we chose the extensor pollicis longus (EPL) rupture, which usually needs a reconstruction because of degenerative changes in the end of ruptured tendon. Either extensor indicis proprius (EIP) transposition or a free autologous tendon graft using the palmaris longus tendon may be usually used. Especially, our question is whether the EIP transfer would bring poor effect on the index finger's independent movement or not. If its extension would be limited, it would be a serious problem for musicians, just as for string players.

One committee member has a case of professional violinist with an EPL rupture, who sustained the injury 3 years ago but did not have a surgical treatment of EIP transfer. She complained that no surgeon could explain the residual effect of loss of the EIP, and that the right index finger is most important for any violinist's performance. She also did not accept alternative surgery with a free tendon graft, because of the risk of avascular necrosis of graft and long time immobilization.

Fortunately, she could hold the bow to complete the music performance, without full extension of the thumb IP joint, but had some difficulty in her daily activities.

Schaller et al. compared the clinical results between the EIP transposition and the tendon graft, and concluded that there were no differences in thumb function (8). They stated that the risk of avascular necrosis of the graft may be limiting factors for the tendon graft, while the limited function of the index finger may be a disadvantage of EIP transfer. DeSmet et al. and Noorda et al. investigated clinical results after EIP transposition, and they noticed limited function of the index finger (9, 10). However, they did not describe this in detail, because there were no complaints on the subjective assessment in patients.

On the other hand, Browne et al. reported that index finger extension lag after EIP transfer was not caused by removal of the force of tendon, but by factors that caused either disruption of normal hood function or tethering of its normal excursion (11). They recommend a repair of the hood at the EIP transfer procedure, to prevent this extension lag. Moore et al. claimed that independent extension of the index finger was retained by sectioning immediately proximal to the dorsal hood while the other fingers were held fully flexed (12). However, 26% of their EIP transfer cases showed an extension lag of the index finger. Kitano et al. stated that the juncturae tendinum between the index and the middle finger mainly caused a loss of extension of the index finger (13). According to von Schroeder et al., the juncturae tendinum between the index and the middle finger is classified into two groups, fascia alone type and filamentous bands type, while EIP had no junction with the other extensor tendons. Kitano et al. described that the index finger extension lag after EIP transfer would be caused by the filamentous band type juncturae tendinum, and they recommended its excision at the time of EIP transfer to retain the extension of the index finger.

Tubiana stated that the EIP transfer might be contraindicated in patients whose occupation requires independent movements of the index finger, such as typists and musicians (14). The suggestion was that there was a disadvantage for the index finger extension after harvesting the EIP for transfer.

One committee member recommended the EIP transfer using the “wide awake” approach described by Don Lalonde (15). That method allows setting of the tension with the patient’s help, and also allows the surgeon to verify independent EDC index function intraoperatively. Usually, the EDC to the index finger can independently extend the digit, so there is no loss of independent index motion after EIP transfer.

Another committee member reported that one violinist who had an EIP transfer for his EPL rupture had to give up his professional career as the extension function was so unbalanced in his left index finger. He recommends the palmaris tendon graft to reconstruct more anatomically.

In conclusion, both the EIP transfer and the tendon graft are alternatives available, even for the musician’s hand. However, hand surgeons should respect the extension function after harvesting the EIP tendon for transfer. A “wide awake” approach would

be recommended in order to confirm independent EDC function of the index finger, and if needed, repair of hood or separation of the juncturae tendinum should be considered. A palmaris tendon graft would make possible an anatomical reconstruction, but surgeons should consider that there would be the risk of avascular necrosis of the graft, and that a long immobilization time may bring another disadvantage for musicians, interrupting their practice for performance.

However, it is questionable whether simply the full extension of the index finger is enough for musicians, who need an independent quick movement of each finger. As stated in the background, we need new criteria for the musician's hand which evaluate not only the static position but the dynamic movement. As such, we need to continue the discussion on optimal management following the trauma to the musician's hand.

In the future, we will expand the discussion to tenosynovitis, hypermobile joints, entrapment neuritis, and focal hand dystonia of musicians.

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