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ASHT Invited Speech

How the wide awake approach is changing hand surgery and hand therapy: Inaugural AAHS sponsored lecture at the ASHT meeting, San Diego, 2012

The American Association for Hand Surgery, an inclusive group of plastic surgeons, orthopedic surgeons, and hand therapists, is pleased to sponsor this inaugural lecture to help foster communication between hand therapists and hand surgeons.

What is wide awake hand surgery?

The wide awake approach to hand surgery means that the patient is unsedated for up to 95% of all hand surgery procedures. For the patient, the experience is reduced to the equivalent of a visit to the dentist where no preoperative tests are required, only lidocaine with epinephrine is injected, and where they get up and go directly home after the procedure.[1]

This is made possible by the recent advance of ample evidence that it is safe to inject epinephrine (adrenaline) in the human finger.[2–8] Epinephrine decreases the bleeding so that the hand surgeon can easily do the surgery without the need for a tourniquet. Deleting the tourniquet negates the need for tourniquet pain, sedation or general anesthesia for hand surgery. Lidocaine provides all of the numbing required to eliminate the pain of surgery. Other recent advances in local anesthetic injection techniques have also rendered the pain of local anesthetic injection to a minimal level,[9,10] even when large areas need to be injected as occurs in bigger hand, wrist, and forearm operations.

This approach has gained rapid popularity in Canada[11] where access to anesthesiologists and main operating theater time has been limited. It is rapidly spreading throughout the United States, Europe, Asia, South America, and Africa.

Surgeons can watch patients comfortably move during surgery

Wide awake hand surgery was initially performed out of necessity in order to get the procedures done without an anesthesiologist. We now understand that it also provides significant improvements in the outcome of several operations. This is because the surgeon can watch the pain free unsedated patient move newly reconstructed tendons, joints and bones before the skin is closed. She can make adjustments in various repairs, K wires or sutures based on what is seen with this active movement to improve the results before the end of the operation, and watch the patient move again and again until things are optimal.

Less tenolysis, less rupture, and true mid-range active movement after flexor tendon repair

After each core suture, the surgeon asks the patient to completely flex and extend the fingers, see movie http://links.lww.com/PRS/A340 link in.[12] If the repair does not fit through the pulleys at the time of surgery, it will certainly not fit through the pulleys after healing because of the decrease in space with the added scar tissue. The surgeon can therefore trim the repair, vent pulleys, or do whatever is required to make sure the repair fits through the pulleys before the skin is closed. In this way, reoperation for tenolysis is reduced.[13]

In a recently published series of 102 consecutive wide awake flexor tendon repair patients from Saint John and Ottawa who had intraoperative testing of the repair,[14] none of the patients who followed the postoperative protocol ruptured. This included following the mantra: “You can move your hand only as we instruct, but you must not use it”. The Saint John protocol is similar to that of Jin Bo Tang.[15] It also includes

- Dorsal splint applied with wrist extended in comfort (20°–30°) and MP joints at 60°–75° (also in comfort), and IP's extended
- Strict hand elevation and immobilization for 48–72 h or until most of the swelling is gone
- Collagen formation does not start until day 3, and moving at day 1 just starts bleeding in the wound which increases internal scarring
- Passive motion warm up before active motion sufficient to regain easy passive ROM
- Focus on active finger extension first 3 weeks to the limit of the splint
- Mid-range true active flexion (as opposed to place and hold) starting at 3 days—only if the finger not too swollen and has easy passive ROM
- 10 repetitions hourly.
- Mid-range active flexion means flex MP as comfort allows, and maximum 45° of PIP and DIP flexion
- Avoid end range finger full flexion
- Just keep it actively moving a little in mid-range so the tendons don't get stuck in scar
- Best if patient is off of all analgesics including acetaminophen or ibuprofen and avoid doing what hurts
- Give them permission to “cheat” in a controlled environment
- Wean off splint at 4–6 weeks

When a surgeon sees full active flexion and extension of the fingers during the surgery, he occasionally sees a gap form because the tendon repair suture was not tight enough, and the forces of active movement bunched the tendon in the suture. In the series quoted above, this occurred 7% of the time. Those gaps would likely have gone on to rupture if the surgeon had not tested the repairs

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during the surgery. However, none of those 7 patients ruptured as the gap was repaired with better sutures during the surgery before the skin was closed. The authors feel this is the most important reason for their decreased rupture rate.

The other major benefit of the surgeon seeing a full range of intraoperative active finger flexion and extension without gapping is the "common sense" understanding that if the patient is allowed to perform half of that amount of motion after surgery, the repair is just not likely to rupture. Half of that motion for us is mid-range active movement starting at day 3 as described above. Post-operative true active movement (as opposed to place and hold) has been the preferred method of mobilization in the United Kingdom for years, beginning with the publication of the Belfast regime in 1989.[16]

"Place and hold" in a fully finger flexed position can place the tendon repair at acute angles to rigid pulley borders and can generate gap that we have seen with wide awake surgery. Fully flexed fingers also generate the highest amount of tension and friction on the repair. We avoid the fully flexed position after surgery for the first few weeks. We just want to keep the tendon moving enough so it does not get stuck in scar.

Intraoperative patient assessment and teaching by the therapist and surgeon

The wide awake approach has also permitted the movement of hand surgery cases out of the main operating theater block into minor procedure rooms where the therapist can attend important parts of the surgery. It has been shown that this type of surgery can be performed outside of the main operating theater block with very acceptable infection rates.[17] Our therapists have their working area 2 doors down from our minor procedure rooms where most of the hand surgery is performed.

The surgeon and therapist can communicate with each other and with the patient during the surgery to provide better outcomes. We find that patients who have witnessed their repair take much more interest and ownership in their postoperative care and movement regime. They are warned during surgery about rupture and tenolysis. Under the direction of the therapist, the patient first practices acceptable movements in a fully pain free environment during the surgery. We find it easier than first teaching patients how to move after the surgery when they were sore.

The surgeon and the therapist get to truly meet the patient during the surgery and assess the patient's character. It is during the surgery that the postoperative regimen is determined by the surgeon and therapist. How to move the patient is finally determined by what kind of patient character we have, the blood supply of the tissues, what the movement looks like during the surgery, and what the repair looks like actively gliding through the pulleys.

Tenolysis

Tourniquet and sedation free patients can assist the surgeon to rupture adhesions with active movement during the surgery. After adhesions have been partially lysed with surgery, active movement can reveal where the tendons are stuck. The surgeon's job is easier as there is no tourniquet pain which makes him feel he needs to rush to do the surgery. A very important benefit is that the patient sees the improved range of motion obtained at the end of the surgery. She knows what is possible if she works through the pain.

Tendon transfer

Most surgeons have made tendon transfers too tight or too loose. One of the main challenges is to get the tension just right for optimal hand function. With the wide awake approach, the patient tests the transfer with active movement during the surgery.[18] The surgeon can then tighten or loosen the transfer if it is not quite right until it is optimal.

Complex secondary tendon surgery

In operations such as greatly delayed flexor tendon repair, the surgeon is not sure what she will find at the time of the surgery. Depending on the excursion of the remaining motors with active movement seen at surgery in the wide awake patient, an intra-operative decision as to which option is best can be made. If there is good movement, simple repair can be performed. If there is some but insufficient movement, a small tendon graft can be inserted between the tendon ends. If there is insufficient active movement, a tendon transfer can be performed. Local anesthesia for all 3 choices is injected before the start of the operation. The awake patient is able to understand the whole thing and be part of the process. It is our experience that patients are a much more cooperative member of the hand team when they have seen it all happen during any operation.

Early protected movement after K wired finger fractures

Early protected movement is as important in finger fractures as it is in flexor tendon injuries for the same reason; a stiff finger is a useless finger, even if the postoperative X ray is pretty. The wide awake approach allows the surgeon to see how "rigidly" K wires hold the fracture together with the forces of active movement during the surgery. This helps determine whether or not additional K wires are required. As in all wide awake operations, patient intraoperative education as to what is acceptable and non-acceptable postoperative movement is a key component to success.

As with flexor tendon repairs, early protected movement is delayed 2–3 days with strict hand elevation and immobilization to decrease internal bleeding and swelling before scar formation starts at day 3. The therapist then shows the patient how to stabilize the phalanges with their other hand and keep joints moving enough so that the tendons don't get stuck (follow movie link http://links.lww.com/PRS/A577 from[19]).

It is best if patients are completely off of all analgesics including acetaminophen and ibuprophen and do not do what hurts. This will avoid loss of reduction as well as K wire skin irritation. For a copy of the Saint John pain guided finger fracture hand therapy protocol, email drdonlalonde@nb.aibn.com.

Simple operations like carpal tunnel surgery and trigger finger release

Patient convenience and comfort is the greatest benefit to wide awake carpal tunnel release. Patients just show up for the surgery and then leave straight after.[20] There is no need for a single mother to get a babysitter or a working person to take time off of work for preoperative anesthetic assessment or testing. There is no postoperative recovery from sedation or opiates that are associated with nausea and vomiting. There is no need for the discomfort of a tourniquet which feels like a blood pressure cuff inflated on your arm for 5 min if you are not sedated. If a patient has severe medical issues like renal failure, morbid obesity, diabetes, etc., the surgery is greatly simplified for the patient without a tourniquet or sedation.

For the surgeon, a much smaller team is required to perform carpal tunnel release. We routinely perform 3 cases an hour with one surgeon and one nurse. The pace is relaxed and each patient gets education during the surgery about postoperative

management, optimal time to return to work, etc. In addition, the costs of the procedure are greatly reduced.[21,22]

Extensor tendon repair and relative motion extension orthoses

The use of relative motion extension orthoses (see Fig. 1) has greatly improved patient convenience after simple extensor tendon lacerations over the hand.[23] The surgeon can assess intraoperative full flexion and extension of the repair during the surgery and decide if only the hand part of the orthosis is required, or whether the patient may also need a wrist immobilizing component. Intraoperative patient character assessment will also help to make this determination. Many compliant patients can return to work the week after surgery with these very functional "yoke splints."

Relative motion extension orthoses are also very useful in flexor lag by forcing the flexors to work harder in activities of daily living. They are also useful in sagittal band tears and reconstruction Fig. 1 legend: relative motion extension orthosis ("yoke" splint).

Relative motion flexion orthoses

Just as the relative motion extension orthoses keep the affected MP joint more extended than the other MP joints, relative motion flexion orthoses keep the affected MP joint flexed relative to the other MP joints (see Fig. 2). These very functional splints are helpful in extensor lag as they put extra pull on the long extensors during activities of daily living.

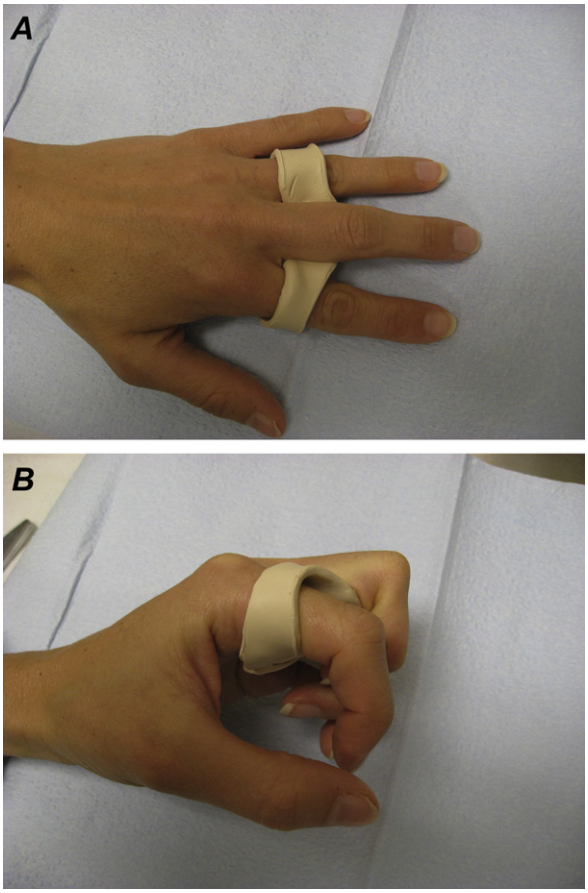

Fig. 1. A (dorsal view) and B (lateral view): The relative motion extension orthosis (previously known as ICAM and yoke splints) keeps the MP joint of the affected finger in more extension than the other MP joints.

Fig. 2. The relative motion flexion orthosis (previously known as ICAM and yoke splints) keeps the MP joint of the affected finger in more flexion than the other MP joints.

With interosseus tears, relative motion flexion orthoses are much more effective in pain relief and letting people get back to work than buddy taping in our experience.

These orthoses also permit early active movement with digital nerve repairs if the repair is not gapping at the time of wide awake repair.

In boutonniere fingers, the relative motion flexion orthosis generates extra pull on the long extensor which pulls the lateral bands dorsally. In addition, the relatively flexed position of the MP joint relaxes the intrinsic muscle pull on those lateral bands. The orthosis can be helpful in both acute and chronic boutonniere management along with serial casting and splinting the PIP in extension. If the acute boutonniere finger stays in PIP extension on its own with a relative motion flexion orthosis, then that is all that is required. In acute and chronic boutonniere where PIP extensor lag is not maintained with the splint alone, we follow the following protocol.

- Serial cast until PIP is fully extended AND the DIP actively flexes completely. It is only with full active DIP flexion that the lateral bands are known to be dorsal to the axis of the PIP joint.
- Then start the countdown of 8 full weeks of full time boutonniere splinting of PIP in full extension and allowing DIP active flexion
- Then start relative motion flexion splinting for 4–8 weeks with night PIP extension splinting

Relative motion flexion and extension splinting can be simulated at surgery by placing a sterile tongue depressor over or under the affected MP joint respectively to see what happens with active movement intraoperatively. Dr. Wyndell Merritt, the originator of relative motion flexion and extension splinting has recently written on the nomenclature[24] of this type of orthosis, and prefers the terms used in this article to the other acronyms (yoke splint, ICAM (immediate controlled active movement), differential gliding splint).

Other operations

The wide awake approach has also been helpful for trapeziectomy,[25] Dupuytren's contracture release,[26,27] wrist arthroscopy and surgery.[28] In joint fusions, the patient is capable of participating in choosing the final position of the joint. Ulnar nerve decompression at the elbow is simplified.

Conclusion

The benefits of the wide awake approach to hand surgeons, therapists and patients are significant. However, one of the most significant changes is that it has permitted interaction of the surgeon, therapist and patient during the surgery. Those who have had the opportunity to engage in this intraoperative communication understand why this development is a milestone in hand surgery.

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