[MUSIC PLAYING]

SPEAKER 1: And get started. And if there's any questions or if anybody wants to see anything in particular, please let us know. So we're going to start here in the palm.

Just to orient the audience, the radial side is over here where my tips my scissors are. And the ulnar side is over here. This is distal, and this is proximal.

And this is obviously, I think, an extended approach for a carpal tunnel release. Most commonly, when it's done with an open procedure, the incision is in line with the radial border of the ring finger, which is right about here. And the hook of the hamate is typically a pretty reliable landmark for orienting yourself within the hand. But most surgeons when they do, I think, in what's today considered an open release will typically go, again, on the radial border of the ring finger, just ulnar to the thenar crease right here, typically starting at a point just distal to the hook of the hamate in line with the radial border of the ring finger, and proximally proceeding to a point just distal to the wrist flexion crease.

So we incise the skin. And we go through the subcutaneous tissues and through the palmar fascia. And right here, you can see the transverse carpal ligament, which has been divided in this specimen.

And if we release a transverse a carpal ligament, we can start to see the median nerve right beneath the transverse carpal ligament. I'm just releasing some tenosynovium here in this specimen. And right here are the flexor digitorus superficially tendons. And right here is the median nerve.

And I dissected out fairly distally. And if you look very carefully, you can be queued to the-- if you look very distally, now again, this is distal. All this is distal. This is proximal. This is radial. This is ulnar. This is the median nerve entering the carpal tunnel.

And if you can see the ulnar and radial branches of the median nerve. Let me just place my retractor here.

SPEAKER 2: [INAUDIBLE] see pretty well.

SPEAKER 1: Can you guys see it pretty well over there? OK. And right here where my tips of my scissors are pointing is the takeoff of the motor recurrent branch of the median nerve and I think the point of emphasis is just noting how radial the takeoff is. And so for the surgeon, it's obviously very important, I think, to keep much of the dissection of the ligament on the ulnar side to avoid any kind of oxygenic injury to the motor recurrent branch.

And the other key point here, especially during an endoscopic carpal tunnel release, when it's a little bit more of a limited exposure, is try to know how distal to proceed with the release. And most commonly, there is a sentinel fat pad noted here in this portion of the exposure. And just distal too that fat pad is the superficial palmar arch, which is right here, which is this sort of red structure. And so the sentinel fat pad is typically, I think, a landmark interoperability, particularly during an endoscopic release towards alerting the surgeon as to how far distally to go.

Most surgeons, I think for a routine carpal tunnel release will not cross the wrist flexion crease proximally to look at the median nerve. They'll typically release the antebrachial fascia in the distal part of the forearm through the incision in the distal palm. But again, we're going to show just for illistrutation purposes here today, the anatomy of the median nerve, and specifically, I think the takeoff of the palmar cutaneous branch of the median nerve.

So I'm just going to release these sutures right here. And deepen some retractors. You guys can still see over there OK?

SPEAKER 3: Yeah, we can see great. You're doing a good job.

SPEAKER 1: OK, great.

SPEAKER 3: You going to comment on the [INAUDIBLE]?

SPEAKER 1: We will be, yeah. We will be. I was just going to show the audience the takeoff of the palmar cutaneous branch of the median nerve.

And so proceeding proximally here in the distal forearm, I release the antibrachial fascia. Here are the FDS tendons right here. And right here is the median nerve. And approximately 5 to 7 centimeters proximal to the wrist flexion crease, we can see the palmar cutaneous branch of the median nerve, which is right there under the tines of my scissor.

You can see it right there actually. So again, it's proceeding kind of more radially. And again, it's another reason I think why we try to avoid making our exposures on the radial side of the hand and wrist-- obviously to avoid injury to the recurrent branch, but really, probably more importantly to avoid injury to the palmar cutaneous branch of the the median nerve.

So that's pretty much, I think, the carpal tunnel, if any of you guys have any other--

SPEAKER 2: Any questions or comments from the audience on things that you wanted to see in the carpal tunnel? So he demonstrated the relationship of the median of the flexor tendon. That's why when we do the surgical release, whether it's endo or open, try to stay ulnar. [INAUDIBLE].

You hear about ABER anatomy where it's transligamentous so it actually comes through the ligament. And we always make sure we watch out for that. Also, palmar cutaneous nerve-- we were doing distal radius and [INAUDIBLE] plating. Also something to keep in mind, is try and stay clear of that branch coming out the median nerve.

SPEAKER 1: I know that Dr. Lubahn asked us this morning to expose the median nerve at the level of the proximal forearm, specifically beneath the lacertus fibrosis. So we quickly did a pretty extensive exposure here to help expose that potential side of compression. So I'm just going to release these sutures here in the skin. All right, and I'm just going to retract these skin flaps backwards here like that.

And the two leaflets of the lacertus-- the radial one is over here, and the ulnar one is over here. And over on the radial side of the arm is the biceps tendon. And right beneath the lacertus is the brachial artery right here. And then over here is the median nerve. And over here is flexor pronator fascia.

And so that's, I think, just a kind of a brief look at the median nerve up at the level of the elbow and proximal forearm. Was there anything else that the audience wanted to see with respect to the proximal median nerve?

SPEAKER 3: Now, Dr. Biswas, who's done a great dissection. And his surgical incision was much like-- we were all taught at residents to decompress the median nerve. But with compression isolated from the lacertus you can do it through a much smaller transverse incision and get a good result. That's a great dissection. Thank you.

SPEAKER 1: Thank you. Thank you. So if we're satisfied with the median nerve dissections, I think we'll probably go over to the radial nerve if that's OK with the audience. And we'll finish up with the ulnar nerve at the conclusion. So are you guys OK up there-- camera?

I think there's been several descriptions, or methods, of decompressing the PIN and the radial nerve. Some people go through a classical, I think, anterior approach of Henry. It's kind of similar to what you would use for exposing and fixing a radial shaft fracture.

Susan MacKinnon and, I think, other authors have described an approach going through the brachial radialis and the ECRL mussel belly is more proximally in the forearm. And this is typically what an incision for that would look like. And MacKinnon also has a pretty informative website on the Wash U wesite, which kind of goes through this exposure fairly in-depth.

But right here is the posterior antebrachial cutaneous nerve. It's kind of hard to see, but I have it right there in my pickups. And in an actual patient, it pretty much marks the interval between the brachial radialis and the ECRL. Right here is that interval-- right here between the brachial radialis and the ECRL.

And after that fascial interval is released, it should be pretty much just blunt dissection right down into the region of the posterior interosseous Susan nerve and radial nerve as well. And so if I deepen the retractors here-- can you guys see pretty well up there? Can you guys see pretty well?

SPEAKER 3: Yes.

SPEAKER 1: OK. Let me dissect a little bit here.

SPEAKER 3: [INAUDIBLE]. [INAUDIBLE] zoomed in a little bit. Dr. Biswas?

SPEAKER 1: Yep. Do you need to zoom out?

SPEAKER 3: Some more in distal.

SPEAKER 1: OK. So right here is the radial nerve. And it's dividing right here into the superficial branch, which is running right underneath the muscle belly of the brachial radialis right here. And it divides into the PIN right here.

And when I was doing this in our session yesterday-- I noticed some vessels probably from the recurrently leash of Henry, which we're draping the PIN. So those are potentially sites of compression for the PIN. So I divided those to help with exposure.

But again, here is superficial radial sensory branch. And here is the PIN. Over here is the medial edge of the ECRB.

And I thought that with patients who have, I think, a PIN-type syndrome or have vague lateral elbow pain, during this exposure, this could potentially be an opportunity to [INAUDIBLE] the ECRB tendon to treat any concomitant lateral epicondylitis at that time. But then, as we proceed more distally along the exposure, the PINs right here. And right here is the leading edge of the supinator right underneath my tenotomy scissors. So I'm just going to go ahead and divide that. And then you can see the remainder of the PIN right there, sort of circling around the proximal aspect of the radius. Is that pretty visible to the audience right there?

SPEAKER 3: Yes, Looks good.

SPEAKER 1: OK, now, Dr. Wong wanted me to show, for instance, during fixation of a proximal radius or radial head fracture, the effect of forearm position on the position of the nerve. So in supination, the nerve obviously enters the field of the surgeon. But with pronaton, the nerve gets pushed away. Can you guys see that pretty well?

So supination-- the nerve gets pushed over laterally into the field of the surgeon. And then pronation-- the nerve gets pushed away. And it's a little more of a safer exposure, I think, for the surgeon. So I thought that was a pretty nice demonstration there. So anything else on the radial nerve that we want to see?

SPEAKER 3: Could you put your forceps on the [INAUDIBLE] once again?

SPEAKER 1: Yeah, so I believe that's right here at the leading edge of the supinators right there in my pickups.

SPEAKER 3: Good. When you do that, can you find any of the branches of the PIN [INAUDIBLE]?

SPEAKER 1: I can try to I can try to dissect it a little bit more. distally. I think I did see a branch to the supinator when I initially came in. It might be kind of hard to see on this specimen right now.

SPEAKER 3: Oh, that looks good.

SPEAKER 1: OK. All right, if you happy with that, I can probably move on to the ulnar nerve at the level of the elbow, and also at Guyon's. Then I can conclude with showing a AIN transfer for the Guyon's canal if that's OK with you guys. All right.

All right, so moving over to the medial side of the elbow here-- We're probably going to focus right here. So this is a pretty extensile exposure, I think, for a traditional cubital tunnel release. But this is typically the incision that we would typically use. It would probably originate about 4 to 5 centimeters proximal to the elbow and proceed about 3 to 4 centimeters distal to the elbow. And then just going to release our skin sutures here.

As we make the approach, just going to insert this retractor here. And I've already released the ulnar last night during our dissections. But if we look more proximally, I believe we can see the intermuscular septum, which is the potential side of compression for the nerve.

So here's the ulnar nerve more proximately. This is the medial head of the triceps. And right here is the intermuscular septum. Can you see that on the camera over there?

SPEAKER 3: Looks good. Yes.

SPEAKER 1: OK, and that's a potential site of compression of the nerve. And so we release the fascia overlying the nerve as we proceed more distally. And I released Osborne's fascia between the medial upper condyle and the olecranon. And I think a pretty important point here, clinically, is these are the branches here of the medial antebrachial cutaneous nerve right here underneath scissors-- right there.

And they essentially drape the ulnar nerve, especially over the region of the upper condyle. And obviously, I think we all know that division of these nerves can lead to potentially symptomatic neuromas. And possibly, I think patients who have persistent medial elbow pain after a cubital tunnel release, but if we recede more distally, you can see the heads of the FCU.

And I split the superficial fascia from the mumeral and ulnar heads of the flexor carpi ulnaris and also divided some of the deeper muscle and the deeper fascia overlying the ulnar nerve. And so this is essentially fully decompressed. And you can kind of see what happens on the effects of the nerve with increased elbow flexion.

This nerve has a tendency now to want to subluxate, unfortunately. But if you keep it positioned posterior to the upper condyle and hyperflex the elbow, you can kind of see the tension that's placed across the nerve. And then you can see, I guess, in this specimen now, the effects of anteriorly transposing it anterior to the upper condyle and how it has a little bit less tension on the nerve as well.

SPEAKER 2: So you guys can see a [INAUDIBLE] there. So surgically, what we're doing is if we're doing it inside the compression, we try and preserve all the connective tissue adhesions. So that doesn't [INAUDIBLE]. I think as long as we're careful in how it would dissect, [INAUDIBLE] actually not very common after surgery. You can see different layers [INAUDIBLE] endoscopic video of the different layers of dissection. But you can see it there with the fascia and also two heads [INAUDIBLE].

SPEAKER 1: OK. So if we're happy with the ulnar nerve at the elbow, I can go ahead and show you the ulnar nerve in the palm. So I just have to switch specimens really quickly. So I'll am show the Guyon's release in the level of the [INAUDIBLE]. Thanks, buddy.

SPEAKER 2: Thank you.

SPEAKER 1: Appreciate it, man. All right, great.

So we show Guyon's tunnel release here on the level of the palm again. So just to orient the audience, if you can't see, is ulnar. This is radial. This is distal. This is proximal.

And the landmarks for the incision at least are the piece of form, which is right here where my pickups are, and then the hook of the hamate, which I'm palpating here with the tips of my [INAUDIBLE] scissors. And this is obviously a very extensile exposure. But we're doing this really, I think, just for demonstration purposes. So we're just going to go ahead and release these sutures here.

That's obviously a great exposure for the ulnar nerve with your previous carpal tunnel incision. Do you think you could access the ulnar nerve as well? I probably could have. I thought that maybe for the audience, this might be just sort of a separate kind of a surgical procedure. So it would be kind of nice to show a separate incision. I was considering trying to conserve the specimens by trying to expose it through the carpal tunnel, But I had this one sort of prepared.

After we make our incision here, I divided the [INAUDIBLE] carpal ligament. And right here is the ulnar nerve [INAUDIBLE] bundle. Here's the ulnar artery, which is-- I'm sorry. Here's the ulnar artery, which is radial to the ulnar nerve at the level of Guyon's canal. Here's the tip of the pisiform. And here is the FCU tendon.

So in this area, the volar carpal ligaments it is a site of potential compression of the ulnar nerve at this level. And then as you proceed more distantly, Palmyra's brevis is already divided, which is a muscle that we divide during the exposure. And so you start to see the ulnar nerve branching. And these are actually the two superficial branches of the ulnar nerve. And right here, actually, where my pickups are pointing is the hook of the hamate.

And if we-- just maybe right now or something-- thanks, man. If we retract the ulnar nerve ulnarly, right here is the hypothenar fascia. Can be seen over there?

And if I peel it over, here's the hook of the hamate. Here's the hypothenar fascia. And in here, actually, is the deep motor branch of the ulnar nerve. Can you see that pretty well? So, deep motor branch, hypothenar fascia, and then here are the sensory branches of the ulnar nerve. And they're continuing, obviously, to the digital nerves to the small and ring fingers.

So that's an example of a Guyon's canal decompression at the level of the wrist. Go ahead.

Nice job.

Great. I was going to go ahead and while we're over here at the level of the wrist, to show a AIN transfer for a patient who has a high ulnar nerve lesion or laceration. So essentially, Guyon's canal release still has to be performed. But the exposure is extended fairly well proximally to the edge of the forearm. And let me put this retractor in here.

These are the FDS tendons right here. And here is, again, the ulnar nerve vascular bundle. And we deepen the exposure, basically, between the ulnar nerve vascular bundle and the FDP tendons. And so let me put this in here like that. I'm retracting the FCU under the tines of my [INAUDIBLE].

SPEAKER 2: So [INAUDIBLE] is showing an AIN to ulnar motor transfer. Dr. [INAUDIBLE] Will go over that in more detail in the lecture later on today. But it's just [INAUDIBLE] see, whereas the position of the anatomy [INAUDIBLE].

SPEAKER 1: So this is obviously a pretty extensive exposure right here. But right here is the pronator quadratus. The FDP muscle belly has been [INAUDIBLE] elevated from the ulna. the transfer really occurs from harvesting the AIN and ensuring that it's collapsed into the motor fascicles of the ulnar nerve. And probably the most reliable way of identifying them is probably identifying the motor branch distally in Guyon's canal and then tracing it in a retrograde fashion so that you can perform, I think, what Mackinnon calls a visual neurolysis.

Over here is actually the dorsal sensory branch of the ulnar nerve. And the motor fascicles are actually sandwiched, literally, in-between the fascicles to the dorsal ulnar sensory branch. And the sensory fascicles is more distally to the digits.

And so obviously doing an internal neurolysis would happen in the operating room with the use of an operating microscope. But the AIN can actually be found entering the leading edge of the pronator quadratus, which has been divided right here. And right there, which is a pretty tight structure, is the anterior interosseous nerve. If you can see it there with my pickups and my tenotomy scissors, it's actually-- right here is the AIN. Can you guys see that pretty well over there?

SPEAKER 3: Yeah, that's great, Dr. Biswas. And I have orders to ask you to stop at this point so we can get moving with the rest of the [INAUDIBLE]. Thank you. That's been a great dissection.

SPEAKER 1: OK, great. Thank you, guys.

SPEAKER 2: Add to that, great job.