Ultrasound Guidance – Selected Indications

Aetna considers ultrasound (US) guidance medically necessary for the following procedures (not an all-inclusive list):

- Adductor canal nerve block
- Arterial line placement
- Baker’s cyst, after failure of unguided procedure
- Breast mass biopsy (see CPB 0269 - Breast Biopsy Procedures (../200_299/0269.html))
- Carpal tunnel injection
- Central venous access (internal jugular, femoral)
- De Quervain tendinopathy, after failure of unguided procedure
- Elbow joint injection or aspiration, after failure of unguided procedure
- Embryo transfer (see CPB 0327 - Infertility (../300_399/0327.html))
- Endovenous laser ablation of the saphenous vein (ELAS) (see CPB 0050 - Varicose Veins (../1_99/0050.html))
- Femoral nerve block for post-operative knee pain
- Hepatic mass biopsy
- Hip joint injection or aspiration

*Please see amendment for Pennsylvania Medicaid at the end of this CPB.*

Additiona l Information

Definitions

Review History

Number: 0952
- Interscalene nerve block
- Intraabdominal or intrapelvic mass biopsy
- Intrathecal drug delivery
- Lumbar puncture (see CPB 0628 - Spinal Ultrasound (//600_699/0628.html))
- Metacarpophalangeal joint injection or aspiration
- Metatarsophalangeal joint injection or aspiration
- Nephrocutaneous access
- Pancreatic mass biopsy
- Placement of vena caval filter (see CPB 0382 - Intravascular Ultrasound (../300_399/0382.html))
- Placement of intracoronary endoluminal devices (see CPB 0382 - Intravascular Ultrasound (../300_399/0382.html))
- Posterior glenohumeral (GH) joint injection or aspiration, after failure of unguided procedure
- Pulmonary or thoracic mass biopsy
- Prostate biopsy for prostate nodule or elevated PSA (see CPB 0001 - Transrectal Ultrasound (../1-99/0001.html))
- Quadratus lumborum nerve block for post-operative pain control after abdominal surgery
- Radiofrequency endovenous occlusion (VNUS) (see CPB 0050 - Varicose Veins (../1-99/0050.html))
- Sciatic nerve block
- Subacromial bursal injection or aspiration, after failure of unguided procedure
- Subtalar joint injection or aspiration
- Supravascular nerve block for post-operative pain control
- Tibiotalar joint injection or aspiration, after failure of unguided procedure
- Thyroid nodule biopsy
- Wrist (radiocarpal) joint injection or aspiration, after failure of unguided procedure.

Aetna considers US guidance of no proven benefit for the following procedures (not an all-inclusive list):

- Acromioclavicular joint
- Costochondral joint
- Endovascular treatment of subclavian artery disease (see CPB 0382 - Intravascular Ultrasound (../300_399/0382.html))
- Epidural injections, including the transforaminal approach (see CPB 0016 - Back Pain - Invasive Procedures (../1_99/0016.html))
- Erector spinae plane (ESP) block for the management of post-operative pain (see CPB 0863 - Nerve Blocks (../800_899/0863.html))
- Facet joint injections (see CPB 0016 - Back Pain - Invasive Procedures (../1_99/0016.html))
- Infiltration between the popliteal artery and capsule of the knee (IPACK) block for pain control following anterior cruciate ligament (ACL) repair
- Intercostal nerve block
- Knee joint (except in morbidly obese individuals (BMI > 40))
- Ligament sheath injections
- Lumbar plexus block with hydrosdissection
- Needle placement during aortography
- Plantar fasciitis injections
- Sacroiliac joint injection (see CPB 0016 - Back Pain - Invasive Procedures (../1_99/0016.html))
- Sclerotherapy for varicose veins (see CPB 0050 - Varicose Veins (../1_99/0050.html))
- Superior cluneal nerve injections
- Tendon injections (other than those listed as medically necessary above)
- Trigger point injections (see CPB 0016 - Back Pain - Invasive Procedures (../1_99/0016.html))
- Thread trigger finger release with hydrosdissection
- Viscosupplement injections (see CPB 0179 - Viscosupplementation (../100_199/0179.html)).

**Background**

In the past 10 years, ultrasound (US) has become increasingly popular to image both peripheral musculoskeletal and axial structures. Presently, US is often used to guide interventions such as aspiration, hydrosdissection, tenotomy, as well as diagnostic or therapeutic injections (e.g., epidural, facet joint, intra-articular, sacroiliac joint, subtalar joint, trigger point and viscosupplement injections). This clinical policy bulletin describes some of the medically necessary as well as experimental/investigational indications associated with the use of US guidance.
Ultrasound Guidance: Medically Necessary Indications

Adductor Canal Nerve Block

An UpToDate review on “Lower extremity nerve blocks: Techniques” (Jeng and Rosenblatt, 2019a) states that “The saphenous nerve is the terminal sensory branch of the femoral nerve. The saphenous nerve block is useful for ambulatory surgeries of the superficial, medial lower leg and provides analgesia of the medial ankle and foot. It can be blocked at the level of the tibial tuberosity below the knee, above the knee using the adductor canal block, or at the ankle as part of an ankle block. Adductor canal block -- The saphenous nerve is blocked at the level of the mid-thigh with the adductor canal block using ultrasound guidance … Ultrasound-guided adductor canal block -- The ultrasound probe is placed perpendicular to the thigh at the midpoint between the anterior superior iliac spine and the base of the patella. The nerve is identified as it lies adjacent to the femoral artery. It is followed distally as it becomes more superficial, traveling with an arterial branch just deep to the sartorius muscle. Using an in-plane approach, after negative aspiration, 10 ml of local anesthetic (LA) is injected deep to the sartorius muscle, at the lateral border of the artery”.

Femoral Nerve Block for Post-Operative Knee Pain

An UpToDate review on “Lower extremity nerve blocks: Techniques” (Jeng and Rosenblatt, 2019a) states that “Femoral nerve block is used to provide anesthesia or postoperative analgesia for surgery of the anterior thigh and knee (e.g., anterior cruciate ligament repair, patella surgery, quadriceps tendon repair). Traditionally, this block was also referred to as the "3-in-1" block, wherein high volume of local anesthetic (LA) can block the femoral, lateral femoral cutaneous, and obturator nerves. This concept was based on the purported existence of a supra-inguinal fluid compartment between the femoral nerve sheath and the lumbar plexus, capable of allowing spread of LA proximally to the lumbar plexus with a single injection at the femoral nerve in the inguinal region. However, a human cadaver study has shown that a fluid compartment between the femoral nerve sheath and the lumbar plexus does not exist, and several studies have shown that a femoral block does not reliably block the obturator nerve, the lateral femoral cutaneous nerve, or the lumbar plexus. Since only the femoral nerve is reliably blocked by this technique, we usually now refer to it as the femoral nerve block. Ultrasound-guided femoral block -- The ultrasound transducer is placed in the inguinal crease to locate the hyperechoic femoral nerve, which can be visualized lateral to the hypoechoic
pulsatile common femoral artery, superficial to the iliopsoas muscle group, and deep to the fascia lata and fascia iliaca. An in-plane or out-of-plane approach can be used. The needle is inserted and the tip placed adjacent to the nerve. After negative aspiration, 20 to 40 mL of LA is injected in 5 mL increments, with gentle aspiration between injections. LA should be seen spreading above, below, or circumferentially around the nerve”.

**Interscalene Nerve Block**

Rajpal et al (2016) noted that post-operative neurologic symptoms after interscalene block and shoulder surgery have been reported to be relatively frequent. These investigators evaluated 300 patients for neurologic symptoms after low-volume, US-guided interscalene block and arthroscopic shoulder surgery (ASS). Patients underwent US-guided interscalene block with 16 to 20 ml of 0.5 % bupivacaine or a mix of 0.2 % bupivacaine/1.2 % mepivacaine solution, followed by propofol/ketamine sedation for ambulatory ASS. Patients were called at 10 days for evaluation of neurologic symptoms, and those with persistent symptoms were called again at 30 days, at which point neurologic evaluation was initiated. Details of patient demographics and block characteristics were collected to assess any association with persistent neurologic symptoms; 6 of 300 patients reported symptoms at 10 days (2 %), with 1 of these patients having persistent symptoms at 30 days (0.3 %). This was significantly lower than rates of neurologic symptoms reported in pre-US investigations with focused neurologic follow-up and similar to other studies performed in the US era. There was a modest correlation between the number of needle re-directions during the block procedure and the presence of post-operative neurologic symptoms. The authors concluded that US guidance of interscalene block with 16- to 20-ml volumes of local anesthetic solution resulted in a lower frequency of post-operative neurologic symptoms at 10 and 30 days as compared with investigations in the pre-US period.

Fuzier et al (2016) performed a cross-sectional survey study on French practice in US-guided regional anesthesia. A questionnaire (demographic data, assessment of the likely benefits of US, and its use in daily practice: blocks and hygiene) was emailed to all members of the French-speaking association of anesthesiologists involved in regional anesthesia. The questionnaire was filled out and returned by 634 experienced anesthesiologists. An US machine was available in 94 % of cases; US-guided regional anesthesia has become the gold standard technique for 3/4 of responders. Interscalene, popliteal sciatic and femoral nerve blocks were
 performed by more than 90 % of responders, most frequently under US 
supervision. Conversely, US guidance was rarely used for spinal or deep nerve 
blocks. A specific sterile sheath was used in only 43 % of cases. The authors 
concluded that the present study confirmed that US guidance has gained in 
popularity for many superficial, but not deep, regional anesthesia procedures in 
France.

Kolny et al (2017) stated that interscalene brachial plexus block (ISBPB) is an 
effective regional anesthesia technique for shoulder surgeries. The superiority of 
the popular US-guided blocks over peripheral nerve stimulator (PNS)-confirmed 
blocks remains unclear. In this study, the efficacy of these different block 
techniques was compared. This prospective, randomized, clinical study included 
109 patients (American Society of Anesthesiologists [ASA] grades I-III) who receive 
20 ml 0.5 % ropivacaine with US-guided blocks (U group), PNS-confirmed blocks 
(N group), or US-guided and PNS-confirmed blocks (dual guidance; NU group) for 
elective shoulder arthroscopy. Block onset time, duration, and effectiveness on the 
Lovett rating scale (LRS) were assessed. There was no statistically significant inter­
group difference in duration of block performance, irrespective of the technique (p = 
0.232). Onset time of complete warmth sensation loss (p < 0.001) and muscle 
strength abolition (p < 0.001) was significantly longer and mean LRS score 
distribution was significantly higher in the N group than in the other groups (p < 0.001). These findings showed a statistically significant correlation between the 
performance of the used block technique and the necessity of conversion to 
general anesthesia because of insufficient block in the N group (58.54 %) than in 
the U (24.44 %) and NU (19.57 %) groups. The authors stated that in a majority of 
studies, US guidance tended to be superior to PNS assistance for ISBPB. 
Compared to PNS assistance, US guidance led to faster onset time of ISBPB, 
lowered the rate of conversions to general anesthesia, and improved LRS scores. 
They concluded that PNS-confirmed needle placement was not necessary to 
ensure effectiveness of US-guided blocks as evidenced by the low rate of 
conversion to general anesthesia in this study. Nevertheless, the dual guidance 
technique (US guidance and PNS confirmation) was recommended to reduce the 
risk of complications and might be considered the regional anesthesia of choice for 
shoulder surgery.

In a RCT, Woo et al (2018) examined if ISBPB using a lower concentration of local 
anesthetic would reduce the incidence of post-thoracotomy ipsilateral shoulder pain 
with assessment of pulmonary function in patients who underwent a lung
lobectomy. A total of 44 patients who underwent a lung lobectomy were randomly assigned to either the control or the interscalene block (ISB) group. Single-shot ISB on the surgical site side was performed using ropivacaine 10-ml 0.25 % including 5-mg dexamethasone under US guidance in the ISB group. Lobectomy and continuous paravertebral block were performed under general anesthesia. The presence of ipsilateral shoulder pain and post-operative adverse events (AEs) were assessed. Pulmonary function tests were performed pre-operatively, the day after surgery, and the day after removing the chest tube. The incidence of ipsilateral shoulder pain was significantly lower in the ISB group than in the control group (54.5 % versus 14.3 %, p=0.006) with an overall incidence of 34.9 %. Post-operative AEs were similar between the groups, with no patients presenting symptoms of respiratory difficulty. Significant reductions in pulmonary function were observed in all patients after lobectomy; however, no significant difference in any of the pulmonary function test variables was observed post-operatively between the groups. The authors concluded that ISB using 10-ml of 0.25 % ropivacaine including 5-mg dexamethasone reduced the incidence of post-thoracotomy ipsilateral shoulder pain and did not result in additional impairment of pulmonary function.

In a prospective, randomized, clinical study, Stasiowski et al (2018a) evaluated the effect of the ISBPB on the occurrence rate of Horner's syndrome. A total of 108 randomly selected patients of ASA I-III status were scheduled for elective shoulder arthroscopy. The patients received 20 ml of 0.5 % ropivacaine either with US-guided ISBPB (U), PNS-confirmation ISBPB (N), or US-guided, PNS-confirmed ISBPB (dual guidance; NU). These researchers observed that Horner's syndrome developed in 12 % of the N group, 6 % of the NU group, and 9 % of the U group. The differences in the rates were not statistically significant (p = 0.616).

Regardless of the technique used to induce ISBPB, this study did not demonstrate any particular anthropometric parameter that pre-disposed patients to the development of Horner's syndrome. Interestingly, these findings showed that NU patients with Horner's syndrome were significantly younger than NU patients without Horner's syndrome. The authors concluded that the precision of ISBPB by use of the dual guidance technique may reduce the rate of Horner's syndrome. The higher water concentration in the prevertebral spaces of younger patients may create better conditions for the diffusion of ropivacaine, which may result in a statistically significant higher Horner's syndrome rate.
In a prospective, randomized, clinical study, Stasiowski et al (2018b) examined the influence of anthropometric parameters and ISBPB on the quality of post-operative analgesia. A total of 109 randomly selected patients of ASA I-III status were scheduled for elective shoulder arthroscopy. Reasons for non-inclusion were as follows: neurological deficit in the upper arm; allergies to amide Las; coagulopathy; and pregnancy. Patients were divided into 3 groups -- group U, group N, or group NU. These researchers observed that the studied groups did not differ in mean time of sensory and motor block terminations and, surprisingly, in each group in individual cases the sensory block lasted up to 890 to 990 mins providing satisfactory long-lasting post-operational analgesia in patients receiving ISBPB. These investigators observed a negative correlation between body mass index (BMI) and termination of the motor block and a positive correlation between age and termination of the sensory block in group U in comparison with the 2 other groups. They found a positive correlation between the male gender and termination of the motor block in patients in group N in comparison with 2 other groups. The authors concluded that in this study, patients received satisfactory analgesia in the post-operational period no matter what technique was used regardless of their age, gender or potentially uncommon anthropometry.

Quadratus Lumborum Nerve Block for Post-Operative Pain Control After Abdominal Surgery

In a prospective RCT, Ishio et al (2017) determined the efficacy of US-guided posterior quadratus lumborum block (QLB) in treating post-operative pain following laparoscopic gynecologic surgery. A total of 70 adult patients scheduled for elective laparoscopic gynecological surgery under general anesthesia were enrolled in this trial. Patients were randomly assigned to either the QLB group or control group. In the QLB group, patients underwent posterior QLB with 20 ml of 0.375 % ropivacaine on each side. Patients were blinded to treatment. At 0, 1, 3, and 24 hours after anesthesia recovery, evaluator recorded the severity of post-operative pain in movement and at rest using a Numeric Rating Scale (NRS). These researchers also evaluated the severity of nausea using NRS and number of additional analgesics. Immediately after recovery from anesthesia, the NRS score for pain in movement did not differ significantly between groups; NRS scores for pain both in movement and at rest were significantly higher in the control group than in the QLB group at 1, 3, and 24 hours after recovery from anesthesia. The

http://www.aetna.com/cpb/medical/data/900_999/0952.html
authors concluded that these findings suggested that posterior QLB significantly reduced post-operative pain in movement and at rest following laparoscopic gynecologic surgery.

Hussein (2018) stated that QLB has 4 approaches. However, there is difference between the 4 approaches regarding efficacy, safety and adverse effects. This investigator compared the analgesic effect between trans-muscular and intra-muscular approaches of the QLB in pediatric patients for elective lower abdominal surgery. A total of 54 patients aged 1 to 6 years were enrolled; patients of both genders were selected. Subjects were randomly classified into 2 groups: Group TQL included patients (n = 27) in whom bilateral QLB was performed using trans-muscular approach, and Group IQL included patients (n = 27) who underwent bilateral QLB using an intra-muscular approach. The primary outcome measure was the number of patients who required rescue analgesia in the first 24 hours. The secondary outcome measures were Face, Legs, Arms, Cry, Consolability (FLACC) score, heart rate, non-invasive blood pressure at 2, 4, 6, 12, and 24 hours post-operatively, and post-operative complications (e.g., local hematoma, quadriceps muscle weakness,). In the first 24 hours after surgery, 13 patients in the IQL group (48.1 %) required rescue analgesia, whereas only 5 patients in the TQL group (18.5 %) required rescue analgesia. The FLACC score was lower in the TQL group than the IQL group at all time intervals up to 24 hours post-operatively. In the TQL group, 8 patients (29.6 %) developed quadriceps weakness; whereas, only 1 patient (3.7 %) in the IQL group developed quadriceps weakness. The author concluded that TQL was better than IQL in the analgesic efficacy following the pediatric lower laparotomy.

Zhu et al (2019) stated that QLB is increasingly being used as a new abdominal nerve block technique. In some studies of mid and lower abdominal and hip analgesia, continuous QLB achieved favorable outcomes as an alternative to continuous intravenous analgesia with opioids. However, the use of continuous QLB for upper abdominal pain is less well characterized. In an open-label RCT, these investigators examined the effects of continuous anterior QLB (CQLB) on post-operative pain and recovery in patients undergoing open liver resection. A total of 63 patients underwent elective open liver resection were randomly divided into CQLB group (n = 32) and patient-controlled analgesia (PCA) group (n = 31). Patients in CQLB group underwent US-guided anterior QLB at the 2nd lumbar vertebral transverse processes before general anesthesia, followed by post-operative CQLB analgesia. Patients in PCA group underwent continuous
intravenous analgesia post-operatively. Post-operative NRS pain scores upon
coughing and at rest, self-administered analgesic counts, rate of rescue analgesic
use, time to 1st out-of-bed activity and anal flatus after surgery, and incidences of
analgesic-related adverse effects were recorded. Post-operative NRS pain scores
on coughing in CQLB group at different time-points and NRS pain score at 48 hours
after surgery were significantly lower than those in PCA group (p < 0.05). Time to
1st out-of-bed activity and anal flatus after surgery in CQLB group were significantly
earlier than those in PCA group (p < 0.05). No significant differences of post-
operative self-administered analgesic counts, rate of post-operative rescue
analgesic usage, or incidences of analgesic-related adverse effects were found
between the 2 groups (p > 0.05). The authors concluded that US-guided anterior
QLB significantly alleviated the pain during coughing after surgery, shortened the
time to 1st out-of-bed activity and anal flatus, promoting post-operative recovery of
the patients undergoing open liver resection.

Salama (2019) stated that adequate pain control after cesarean section (CS) is
important to help the newly delivered mothers to feed and care their newborns
together with early ambulation of the parturients to avoid the risk of thrombo-
embolism and development of chronic abdominal and pelvic pain. In a RCT, these
investigators compared the efficacy of QLB and intra-thecal morphine for post-
operative analgesia after CS. A total of 90 pregnant women with a gestation of 37
weeks or more scheduled for elective CS were enrolled in this study. All subjects
received spinal anesthesia, and after surgery, QLB was performed. They were
randomly allocated to control group (CG, 0.1-ml saline added to spinal drug and 24-
ml saline for QLB), intra-thecal morphine group (ITM, 0.1-mg morphine added to
spinal drug and 24-ml saline for QLB), or QLB group (0.1-ml saline added to spinal
drug and 24-ml 0.375 % ropivacaine for QLB). Integrated Analgesia Score (IAS),
NRS at rest and during movement, morphine requirements in the first 48 hours,
time to 1st morphine dose, time to 1st ambulation, and morphine related side
effects were recorded. IAS and NRS scores at rest and during movements were
significantly less in QLB and ITM than CG. Moreover, QLB had lower IAS and NRS
scores at rest and during movements in comparison to ITM. Time to 1st morphine
dose was significantly longer in QLB than in ITM and CG. Also, morphine
requirements in the first 48 hours was significantly lower in QLB than ITM and CG
(18.2 ± 9.6 mg in QLB versus and 42.8 ± 10.4 mg and 61 ± 12.9 mg in ITM and CG,
respectively) (p = 0.001). No significant difference between the 3 groups regarding
time to 1st ambulation (13.4 ± 1.8 hours in QLB versus 11.7 ± 1.9 hours in CG and
12.9 ± 1.6 hours in ITM). Incidence of morphine related side effects was
significantly higher in ITM compared to CG and QLB. The authors concluded that QLB and intra-thecal morphine were effective analgesic regimens after CS. However, QLB provided better long lasting analgesia together with reduction of total post-operative morphine consumption.

Sato (2019) noted that US-guided QLB is a regional anesthetic technique that can provide peri-operative analgesia for all age groups, including pediatric patients undergoing abdominal surgery. This researcher hypothesized that the QLB would be as effective as a caudal block, the gold standard of pediatric lower abdominal regional anesthesia, in providing pain control after ureteral re-implantation but also have a longer duration. A total of 47 pediatric patients aged 1 to 17 years undergoing bilateral ureteral re-implantation surgery via a low transverse incision were enrolled and randomized into the QLB and caudal block groups. All blocks were performed pre-operatively under general anesthesia. This investigator analyzed the following outcomes: the requirement for narcotic analgesics, pain score, episodes of emesis, and complications at 0, 4, 24, and 48 hours post-operatively. The study included 44 patients after excluding 3 who were ineligible. The fentanyl requirement for post-operative rescue analgesia during the first 24 hours was significantly lower in the QLB group than in the caudal block group (median [interquartile range (IQR)]: 0 [0 to 1] versus 3 [0 to 5], \( p = 0.016, 95 \% \) confidence intervals (CI): -4 to 0); but not at 30 mins, 4 hours or 48 hours. No significant difference was observed in the pain scores or the incidence of interventions to treat nausea and vomiting during the entire period. No post-operative complication was observed. The author concluded that QLB was more effective in reducing the post-operative opioid requirement for rescue analgesia during the initial 24 hours than caudal ropivacaine/morphine.

**Sciatic Nerve Block**

An UpToDate review on “Lower extremity nerve blocks: Techniques” (Jeng and Rosenblatt, 2019a) states that “The sciatic nerve block provides complete anesthesia of the leg below the knee, with the exception of a strip of medial skin innervated by the saphenous nerve. Combined with femoral or saphenous nerve block, it provides analgesia for surgery of the distal anterior thigh; anterior knee; and lateral calf, ankle, or foot. The sciatic nerve block can be performed using either an anterior or a posterior approach, with similar success rates for surgery below the knee … Ultrasound-guided sciatic block -- For an ultrasound-guided sciatic block, the ultrasound transducer is held transverse to the course of the
nerve. The sciatic nerve can be blocked via a transgluteal (needle inserted just distal and deep to gluteus maximus muscle) or infragluteal (just below the level of the subgluteal crease) approach. For both approaches, the patient is placed in a position between lateral decubitus and prone, with the hip and knee flexed”.

Supraclavicular Nerve Block for Post-Operative Pain Control

Karaman et al (2019) compared the effects of supraclavicular brachial plexus block (SCBPB) with ISBPB in terms of post-operative pain and quality of recovery after ASS. A total of 62 adult patients scheduled for ASS under general anesthesia were randomized into 2 groups to receive either ISBPB (IB group, n = 31) or SCBPB (SB group, n = 29) with 20-ml of 0.25 % bupivacaine under US guidance. Assessments included post-operative pain scores, additional analgesic requirement, timing of the 1st analgesic requirement, quality of recovery-40 (QoR-40) scores, block characteristics, and side effects. No significant differences were found between the 2 groups for pain scores (p = 0.34), timing of 1st analgesic requirement (p = 0.30), additional analgesic requirement (p = 0.34), or QoR-40 (p = 0.13) scores. The block characteristics regarding procedure time (p = 0.95), block failure, and onset time of sensory blockade (p = 0.33) were similar. Horner’s syndrome occurred in 8 patients in the ISBPB group and 1 patient in the SCBPB group (p = 0.015). The authors concluded that this study showed that US-guided SCBPB was as effective as ISBPB in reducing post-operative pain and improving the quality of recovery for ASS.

Furthermore, an UpToDate review on “Upper extremity nerve blocks: Techniques” (Jeng and Rosenblatt, 2019b) states that “The supraclavicular approach blocks the brachial plexus at the level of the nerve trunks (upper, middle, and lower), where the nerves are packed closely together. Supraclavicular block provides a reliable, rapid onset and dense block for surgery of the distal two-thirds of the upper extremity, including those surgeries requiring an upper extremity tourniquet (e.g., hand surgery) … Ultrasound-guided supraclavicular block -- We suggest the use of ultrasound guidance whenever a supraclavicular block is performed in order to minimize the chance of vascular puncture and pneumothorax. The ultrasound transducer is placed in a transverse position parallel to and just above the clavicle. The subclavian artery is identified by moving the transducer medially along the clavicle and directing the transducer toward the first rib. The brachial plexus at the level of the trunks and divisions appears as a "bundle of grapes" lateral to the subclavian artery. The lateral end of the
transducer is often rotated slightly cephalad to visualize the brachial plexus in a more short-axis plane (perpendicular to its path). The needle is inserted in-plane from lateral to medial (parallel to the transducer), with the target being the junction of the subclavian artery, brachial plexus, and first rib ("corner pocket") and LA is injected to lift the brachial plexus off the first rib. Twenty to 30 mL of LA is injected, after negative aspiration for blood, in 5-mL increments, while looking for spread around the nerves. Most practitioners prefer a two-injection technique, with one-half of the LA deposited at the "corner pocket" and the other one-half deposited more superficially between trunks of the plexus or above the plexus. Injection should be stopped if the patient experiences pain or paresthesia”.

**Ultrasound Guidance: Experimental and Investigational Indications**

*Costochondral Injection*

Cho and Park (2018) stated that Tietze’s syndrome is an uncommon disease of unknown etiology that manifests as pain and tenderness of the para-sternal joints. To-date, however, there has been no report on US findings concerning swelling of the costochondral joint in Tietze’s syndrome. Moreover, there has been no research investigating images of US-guided corticosteroid injection, although corticosteroid injection is one of the most important treatments for Tietze’s syndrome. These investigators reported a case of Tietze’s syndrome where US images were used in the diagnostic and therapeutic process. A 70-year old man was examined for left chest pain that had lasted for several weeks. Physical examination at the authors’ clinic revealed a focal tenderness of the left 3rd costochondral joint, and ultrasonography showed a swelling of the left 3rd costochondral joint. Considering both the clinical and radiological examinations, the patient received a diagnosis of Tietze’s syndrome with costochondral joint swelling. Then, the patient agreed to an US-guided left 3rd costochondral corticosteroid injection after receiving a detailed explanation of the disease and treatment. After receiving 3 US-guided corticosteroid injections, his chest pain subsided, and the swelling and tenderness also disappeared completely. The authors concluded that the findings of this case suggested that US was important in the diagnosis and treatment of Tietze’s syndrome.

*Infiltration between the Popliteal Artery and Capsule of the Knee (IPACK) Block for Pain Control Following Anterior Cruciate Ligament (ACL) Repair*

Thobhani et al (2017) stated that novel regional techniques, including the adductor canal block (ACB) and the local anesthetic infiltration between the popliteal artery and capsule of the knee (IPACK) block, provide an alternative approach for controlling pain following total knee arthroplasty (TKA). This study compared 3 regional techniques (femoral nerve catheter [FNC] block alone, FNC block with IPACK, and ACB with IPACK) on pain scores, opioid consumption, performance during physical therapy, and hospital length of stay (LOS) in patients undergoing TKA. All patients had a continuous peri-neural infusion, either FNC block or ACB. Patients in the IPACK block groups also received a single injection 30-ml IPACK block of 0.25 % ropivacaine. Pain scores and opioid consumption were recorded at post-anesthesia care unit (PACU) discharge and again at 8-hour intervals for 48 hours. Physical therapy performance was measured on post-operative days (POD) 1 and 2, and hospital LOS was recorded. These researchers found no significant differences in the 3 groups with regard to baseline patient demographics. Although these investigators observed no differences in pain scores between the 3 groups, opioid consumption was significantly reduced in the FNC with IPACK group. Physical therapy performance was significantly better on POD 1 in the ACB with IPACK group compared to the other 2 groups. Hospital LOS was significantly shorter in the ACB with IPACK group. The authors concluded that the findings of this study demonstrated that an IPACK block reduced opioid consumption by providing effective supplemental analgesia following TKA compared to the FNC-only technique; ACB with IPACK provided equivalent analgesia and improved physical therapy performance, allowing earlier hospital discharge.

The authors stated that this study had several drawbacks. Because these investigators identified no patients who would fit the criteria to receive ACB only during the study period, this study lacked a group that received ACB only, which would allow better analysis of the contribution of the IPACK block to an ACB. Because the ACB has gained attention by providing adequate analgesia to the anterior knee while minimizing motor impairment, addition of the IPACK block could improve posterior knee analgesia without sacrificing distal motor and sensory impairment. Comparing ACB only to ACB with IPACK block should be a goal for future research. Nevertheless, no prior publications had described the effects of the IPACK block for addressing posterior knee pain following TKA, and thus the opioid-sparing effect of the IPACK block when combined with the FNC block is a novel finding. Retrospective studies may suffer from assignment bias, possibly resulting in baseline differences between groups. However, the consecutive enrollment of patients in this study may have limited selection bias. In addition, this
trial was a descriptive study of the benefits of a novel approach to regional analgesia for a common surgical procedure. An investigator needs to know a clinical delta, the difference in expectation that one regional technique provides compared to another technique, to calculate sample size. Because of the novel approach of this study, such information was not available, so this study could suffer from assignment bias. However, a strength of this study was that it allowed other investigator groups to validate these findings, and when needed, to use these findings to calculate a clinical delta for the appropriate sample size needed for a prospective RCT.

Sankineani et al (2018) noted that ACB is a peripheral nerve blockade technique that provides good pain control in patients undergoing TKA, which however does not relieve posterior knee pain. The recent technique of an US-guided IPACK has shown promising results in providing significant posterior knee analgesia without affecting the motor nerves. These researchers carried out a prospective study in 120 patients undergoing unilateral TKA. The initial 60 consecutive patients received ACB + IPACK (Group 1, n = 60), and the subsequent 60 patients received ACB alone (Group 2, n = 60). All patients were evaluated with visual analog scale (VAS) score for pain recorded at 8 hours, POD 1 and POD 2 after the surgery. The secondary outcome measures were range of movement (ROM) and ambulation distance. VAS score showed significantly (p < 0.005) better values in ACB + IPACK group compared to the ACB group. The mean ROM of knee and ambulation distance also showed significantly better values in ACB + IPACK group compared to the ACB group. The authors concluded that ACB + IPACK is a promising technique that offered improved pain management in the immediate post-operative period without affecting the motor function around the knee joint resulting in better ROM and ambulation compared to ACB alone. This was a relatively small study (n = 60 in the ACB + IPACK group); and its findings were confounded by the combined use of ACB and IPACK.

Kim et al (2018) stated that peri-articular injections (PAIs) are becoming a staple component of multi-modal joint pathways. Motor-sparing peripheral nerve blocks, such as the IPACK block and the ACB, may augment PAI in multi-modal analgesic pathways for TKA, but supporting literature remains rare. These researchers hypothesized that the addition of ACB and IPACK block to PAI would lower pain on ambulation on POD 1 compared to PAI alone. This triple-blinded, RCT included 86 patients undergoing unilateral TKA. Patients either received a PAI (control group, n = 43), or an IPACK block with an ACB and modified PAI (intervention group, n =
43). The primary outcome was pain on ambulation on POD 1; secondary outcomes included NRS pain scores, patient satisfaction, and opioid consumption. The intervention group reported significantly lower NRS pain scores on ambulation than the control group on POD 1 (difference in means [95 % CI]: -3.3 [-4.0 to -2.7]; p < 0.001). In addition, NRS pain scores on ambulation on POD 0 (-3.5 [-4.3 to -2.7]; p < 0.001) and POD 2 (-1.0 [-1.9 to -0.1]; p = 0.033) were significantly lower. Patients in the intervention group were more satisfied, had less opioid consumption (p = 0.005, PACU, p = 0.028, POD 0), less intravenous opioids (p < 0.001), and reduced need for intravenous PCA (p = 0.037). The authors concluded that the addition of IPACK block and ACB to PAI significantly improved analgesia and reduced opioid consumption after TKA compared to PAI alone. They stated that this study strongly supported IPACK block and ACB use within a multi-modal analgesic pathway. This was a relatively small study (n = 43 in the ACB + IPACK block + PAI group); and its findings were confounded by the combined use of ACB, IPACK and PAT.

Injection for Low Back Pain

In a systematic review, Hofmeister and colleagues (2019) evaluated the literature comparing US-guided injections to fluoroscopy-guided injections for the management of low back pain (LBP). Medline, Cochrane CENTRAL Register of Controlled Trials, Embase, and NHSEED were searched from 2007 to September 26, 2017. Inclusion criteria included: RCT design, compared US-guided and fluoroscopy-guided injections for LBP; dose and volume of medications injected were identical between trial arms, and reported original data. A total of 101 unique records were identified, and 21 studies were considered for full-text inclusion; 9 studies formed the final data set. Studies comparing US- and fluoroscopy-guided injections for LBP management reported no difference in pain relief, procedure time, number of needle passes, changes in disability indices, complications or AEs, post-procedure opioid consumption, or patient satisfaction. The authors concluded that fluoroscopic guidance of injections for the management of LBP was similar in efficacy to US guidance. These researchers stated that further study is needed to understand the exact role of US in image-guided injections.

Injection for Plantar Fasciitis

Li and co-workers (2014) noted that it is controversial whether US-guided injection of corticosteroid is superior to palpation-guided injection for plantar fasciitis (PF). In a meta-analysis, these investigators compared the effectiveness of US-guided and
palpation-guided injection of corticosteroid for the treatment of PF. Databases (Medline, Cochrane library and Embase) and reference lists were searched from their establishment to August 30, 2013 for RCTs comparing US-guided with palpation-guided injection for PF. The Cochrane risk of bias (ROB) tool was used to assess the methodological quality. Outcome measurements were VAS, tenderness threshold (TT), heel tenderness index (HTI), response rate, plantar fascia thickness (PFT), hypo-echogenicity and heel pad thickness (HPT). The statistical analysis was performed with software RevMan 5.2 and Stata 12.0. When I² was less than 50 %, the fixed-effects model was adopted. Otherwise the randomized-effects model was adopted. The Grading of Recommendations Assessment, Development and Evaluation (GRADE) system was used to assess the quality of evidence. A total of 5 RCTs with 149 patients were identified and analyzed. Compared with palpation-guided injection, US-guided injection was superior with regard to VAS, TT, response rate, PFT and hypo-echogenicity. However, there was no statistical significance between the 2 groups for HPT and HTI. The authors concluded that US-guided injection of corticosteroid appeared to be more effective than palpation-guided injection; however, these findings need to be confirmed by further research with well-designed and large studies.

David and associates (2017) stated that plantar heel pain, commonly resulting from plantar fasciitis, often results in significant morbidity. Therapeutic options include non-steroidal anti-inflammatory drugs (NSAIDs), orthoses, physical therapy, physical agents (e.g., extracorporeal shock wave therapy (ESWT), laser) and invasive procedures including steroid injections. In a Cochrane review, these researchers examined the effects (benefits and harms) of injected corticosteroids for treating plantar heel pain in adults. They searched the Cochrane Bone, Joint and Muscle Trauma Group Specialized Register, the Cochrane Central Register of Controlled Trials (the Cochrane Library), Medline, Embase, CINAHL, clinical trials registries and conference proceedings; latest search was March 27, 2017; RCTs and quasi-RCTs of corticosteroid injections in the treatment of plantar heel pain in adults were eligible for inclusion. At least 2 review authors independently selected studies, assessed risk of bias and extracted data. These investigators calculated RRs for dichotomous outcomes and mean differences (MDs) for continuous outcome measures. They used a fixed-effect model unless heterogeneity was significant, when a random-effects model was considered. They assessed the overall quality of evidence for individual outcomes using the GRADE approach. These researchers included a total of 39 studies (36 RCTs and 3 quasi-RCTs) that involved a total of 2,492 adults. Most studies were small (median = 59 subjects).
Subjects' mean ages ranged from 34 years to 59 years. When reported, most subjects had heel pain for several months. The trials were usually conducted in outpatient specialty clinics of tertiary care hospitals in 17 countries. Steroid injection was given with a local anesthetic agent in 34 trials. Follow-up was from 1 month to over 2 years. With one exception, trials were assessed at high risk of bias in 1 or more domains, mostly relating to lack of blinding, including lack of confirmation of allocation concealment. With 2 exceptions, these researchers rated the available evidence as very low quality, implying in each case that they were "very uncertain about the estimate". The 39 trials covered 18 comparisons, with 6 of the 7 trials with 3 or 4 groups providing evidence towards 2 comparisons; 8 trials (724 subjects) compared steroid injection versus placebo or no treatment. Steroid injection may lead to lower heel pain VAS (0 to 100; higher scores = worse pain) in the short-term (less than 1 month) (MD -6.38, 95% CI: -11.13 to -1.64; 350 subjects; 5 studies; I² = 65%; low quality evidence). Based on a minimal clinically significant difference (MCID) of 8 for average heel pain, the 95% CI included a marginal clinical benefit. This potential benefit was diminished when data were restricted to 3 placebo-controlled trials. Steroid injection made no difference to average heel pain in the medium-term (1 to 6 months follow-up) (MD -3.47, 95% CI: -8.43 to 1.48; 382 subjects; 6 studies; I² = 40%; low quality evidence). There was very low quality evidence for no effect on function in the medium-term and for an absence of serious AES (219 subjects, 4 studies). No studies reported on other AEs, such as post-injection pain, and on return to previous activity. There was very low quality evidence for fewer treatment failures (defined variously as persistent heel pain at 8 weeks, steroid injection at 12 weeks, and unrelieved pain at 6 months) after steroid injection. The available evidence for other comparisons was rated as very low quality. These researchers were therefore very uncertain of the estimates for the relative effects on people with heel pain of steroids compared with other interventions in: Tibial nerve block with anesthetics (2 trials); orthoses (4 trials); oral NSAIDs (2 trials); and intensive physiotherapy (1 trial). Physical modalities: ESWT (5 trials); laser (2 trials); and radiation therapy (1 trial). Other invasive procedures: locally injectable NSAID (1 trial); platelet-rich plasma injections (PRP; 5 trials); autologous blood injections (2 trials); botulinum toxin injections (2 trials); cryo-preserved human amniotic membrane injection (1 trial); localized peppering with a needle (1 trial); dry needling (1 trial); and mini-scalpel needle release (1 trial). These investigators were also uncertain about the estimates from trials testing different techniques of local steroid injection: US-guided versus palpatation-guided (5 trials); and scintigraphy-guided versus palpation-guided (1 trial). An exploratory analysis involving pooling data from 21 trials.
reporting on AEs revealed 2 ruptures of plantar fascia (reported in 1 trial) and 3 injection site infections (reported in 2 trials) in 699 participants allocated to steroid injection study arms; 5 trials reported a total of 27 subjects with less serious short-term AEs in the 699 subjects allocated steroid injection study arms. Reported treatments were analgesia, ice or both. Given the high risk of selective reporting for these outcomes and imprecision, this evidence was rated at very low quality. The authors found low quality evidence that local steroid injections compared with placebo or no treatment may slightly reduce heel pain up to 1 month but not subsequently. The available evidence for other outcomes of this comparison was very low quality. Where available, the evidence from comparisons of steroid injections with other interventions used to treat heel pain and of different methods of guiding the injection was also very low quality. Although serious AES relating to steroid injection were rare, these were under-reported and a higher risk cannot be ruled out. The authors concluded that further research should focus on establishing the effects (benefits and harms) of injected steroids compared with placebo in typical clinical settings, subsequent to a course of unsuccessful conservative therapy. Ideally, this should be preceded by research, including patient involvement, aimed to obtain consensus on the priority questions for treating plantar heel pain.

Li and colleagues (2018) noted that the argument on whether ESWT and US-guided corticosteroid injections (CSIs) exert an equivalent pain control or which is the better treatment for PF in adults remains to be resolved. These researchers performed a meta-analysis to make a relatively more credible and overall assessment about which treatment method performs better pain control in treatment of PF in adults. From the inception to July 2018, the Embase, PubMed, Web of Science, and Cochrane Library electronic databases were searched for all relevant studies. Only RCTs focusing on comparing ESWT and CSI therapies in PF cases in adults were included. The primary outcome measure was VAS reduction, whereas the secondary outcomes included treatment success rate, recurrence rate, function scores, and AEs. A total of 9 RCTs involving 658 cases were included in this meta-analysis. The findings of this meta-analysis showed that high-intensity ESWT had superior pain relief and success rates relative to the CSI group within 3 months, but the ESWT with low intensity was slightly inferior to CSI for efficacy within 3 months. In addition, patients with CSI may tend to increase the need for the analgesic and more AES may be associated with the ESWT. However, the ESWT and CSI presented similar recurrent rate and functional outcomes. The authors concluded that this analysis showed that the pain relief and
success rates were related to energy intensity levels, with the high-intensity ESWT had the highest probability of being the best treatment within 3 months, followed by US-guided CSI, and low-intensity ESWT. These researchers stated that more high-quality RCTs with long-term follow-up duration are needed to further compare the differences of US-guided CSI and ESWT for adults with PF.

Furthermore, an UpToDate review on “Plantar fasciitis” (Buchbinder, 2019) states that “There is moderate-quality evidence that use of ultrasound to guide placement of the injection does not improve pain more than palpation-guided injections”.

Injection for Shoulder Pain

Rutten and colleagues (2007) stated that blind injection of the subacromial-subdeltoid bursa (SSB) for diagnostic purposes (Neer test) or therapeutic purposes (corticosteroid therapy) is frequently used. Poor response to previous blind injection or side effects may be due to a misplaced injection. It is assumed that US-guided injections are more accurate than blind injections. In a randomized study, these investigators compared the accuracy of blind injection to that of US-guided injection into the SSB. A total of 20 consecutive patients with impingement syndrome of the shoulder were randomized for blind or US-guided injection in the SSB. Injection was performed either by an experienced orthopedic surgeon or by an experienced musculoskeletal radiologist. A mixture of 1-ml methylprednisolone acetate, 4-ml prilocaine hydrochloride and 0.02-ml (0.01 mmol) gadolinium DTPA was injected. Immediately after injection, a 3D-gradient T1-weighted magnetic resonance imaging (MRI) of the shoulder was performed. The location of the injected fluid was independently assessed by 2 radiologists who were blinded as to the injection technique used. The accuracy of blind and US-guided injection was the same. The fluid was injected into the bursa in all cases. The authors concluded that blind injection into the SSB was as reliable as US-guided injection and could therefore be used in daily routine. These researchers noted that US-guided injections may offer a useful alternative in difficult cases, such as with changed anatomy post-operatively or when there is no effective clinical outcome.

In a prospective, randomized, double-blind study, Dogu and co-workers (2012) compared the accuracy of blind versus US-guided corticosteroid injections in subacromial impingement syndrome and examined the correlation between accuracy of the injection location and clinical outcome. A total of 46 patients with subacromial impingement syndrome were randomized for US-guided (group 1, n =
23) and blind corticosteroid injections (group 2, n = 23); MRI analysis was performed immediately after the injection. Changes in shoulder ROM, pain, and shoulder function were recorded. All patients were assessed before the injection and 6 weeks following the injection. Accurate injections were performed in 15 (65 %) group 1 patients and in 16 (70 %) group 2 patients. There was no statistically significant difference in the injection location accuracy between the 2 groups (p > 0.05). At the end of the 6th week, regardless of whether the injected mixture was found in the subacromial region or not, all of the patients showed improvements in all of the parameters evaluated (p < 0.05). The authors concluded that blind injections performed in the subacromial region by experienced individuals were reliably accurate and could therefore be given in daily routines. Corticosteroid injections in the subacromial region were very effective in improving the pain and functional status of patients with subacromial impingement syndrome during the short-term follow-up.

In a systematic review and meta-analysis, Wu and colleagues (2015) examined the effectiveness of US-guided (USG) versus blind (landmark-guided, LMG) corticosteroid SSB injection in adults with shoulder pain. Searches were performed on PubMed, Ovid Medline, Ovid Embase, Ovid Cochrane CENTRAL, Web of Science, Google Scholar, and Scopus from database inception through March 27, 2015. Studies included trials comparing USG versus LSG injections for the treatment of adults with SSB. Two reviewers independently performed data extraction and appraisal of the studies. The outcome measures collected were decreased VAS and Strengths and Difficulties Questionnaire (SDQ) scores, increased shoulder function scores and shoulder abduction ROM, and the effective rate at 6 weeks after injection. A total of 7 papers including 445 patients were reviewed; 224 received LMG injections and 221 received USG injections. There was a statistically significant difference in favor of USG for pain score [mean difference [MD] = 1.19, 95 % CI: 0.39 to 1.98, p = 0.003] and SDQ score [MD = 5.01, 95 % CI: 1.82, 8.19, p = 0.02] at 6 weeks after injection. Furthermore, there was a statistically significant difference between the groups, with greater improvement reported of shoulder function scores [SMD = 0.89, 95 % CI: 0.56 to 1.23, p < 0.001] and shoulder abduction ROM [MD 32.69, 95 % CI: 14.82 to 50.56, p < 0.001] in the USG group. More effective rate was also reported with USG group and the difference was statistically significant [risk ratio (RR) = 1.6, 95 % CI: 1.02 to 2.50, p = 0.04]. The authors concluded that US-guided corticosteroid injections potentially offered a significantly greater clinical improvement over blind SSB injections in adults with shoulder pain.
In a RCT, Cole and associates (2016) examined the clinical outcome of US-guided subacromial injections compared with blind subacromial injections for subacromial impingement syndrome. A total of 56 shoulders with subacromial impingement syndrome were randomized into 2 groups: 28 shoulders received a subacromial corticosteroid injection with US guidance (US group), and 28 shoulders received a subacromial corticosteroid injection without US guidance (blind group). The VAS for pain with overhead activities and the American Shoulder and Elbow Surgeons (ASES) score were obtained before the injection and at 6 weeks after the injection. The VAS score for pain with overhead activities decreased from $59 \pm 5$ mm (mean ± SEM) before the injection to $33 \pm 6$ mm at 6 weeks after the injection in the US group ($p < 0.001$) and from $63 \pm 4$ mm to $39 \pm 6$ mm, respectively, in the blind group ($p < 0.001$). The decrease in the VAS score was not significantly different between the groups ($p > 0.999$). The ASES score increased from $57 \pm 2$ before the injection to $68 \pm 3$ at 6 weeks after the injection in the US group ($p < 0.01$) and from $54 \pm 3$ before the injection to $65 \pm 4$ after the injection in the blind group ($p < 0.01$), with no significant difference between the groups ($p = 0.7$); 4 shoulders (14%) in the US group and 6 shoulders (21%) in the blind group eventually needed surgery ($p = 0.7$). The authors concluded that no significant differences were found in the clinical outcome when comparing US-guided subacromial injections to blind subacromial injections for subacromial impingement syndrome.

**Intercostal Nerve Block**

Shankar and Eastwood (2010) noted that steroid injection around the intercostal nerves (ICN) is one of the therapeutic options for intercostal neuralgia. The technique may be performed blindly, under fluoroscopic guidance (FSG) or with the use of USG. This study was a retrospective comparison of image guidance for intercostal steroid injections. After Institutional Review Board (IRB) approval, a retrospective review of all patient charts who received intercostal steroid injections from 2005 to 2009 was performed. A total of 39 blocks were performed in that period; 12 were USG blocks and 27 FSG blocks. The pre-procedure VAS and post-procedure VAS and the duration of pain relief were compared between the 2 techniques. The median change in the VAS for FSG and USG were -5.000 and -4.000, respectively, and duration of pain relief with a MD of 2 weeks (95% CI: -4 to 7). There were 2 occasions of intravascular spread noticed with the FSG although this should not affect the study result as the needle was re-positioned and steroid injected only after contrast dye confirmation. The authors concluded that with similar change in VAS scores and duration of pain relief between the 2 guidance
methods based on this retrospective study, both image guidance techniques may offer similar pain relief. The main drawbacks of this study were its retrospective design, small sample size (n = 12 for US guidance group), and the lack of a comparison group of "blind" injections by means of anatomic landmarks.

Bhatia et al (2013) stated that ICN injections are routinely performed under anatomic landmark or FSG for acute and chronic pain indications; US is being used increasingly to perform ICN injections, but there is lack of evidence to support the benefits of US over conventional techniques. These researchers compared guidance with US versus anatomic landmarks for accuracy and safety of ICN injections in cadavers in a 2-phase study that included evaluation of deposition of injected dye by dissection and spread of contrast on fluoroscopy. A cadaver experiment was performed to validate US as an imaging modality for ICN blocks. In the 1st phase of the study, 12 ICN injections with 2 different volumes of dye were performed in 1 cadaver using anatomic landmarks on one side and US-guidance on the other (6 injections on each side). The cadaver was then dissected to evaluate spread of the dye. The 2nd phase of the study consisted of 74 ICN injections (37 US-guided and 37 using anatomic landmarks) of contrast dye in 6 non-embalmed cadavers followed by fluoroscopy to evaluate spread of the contrast dye. In the 1st phase of the study, the intercostal space was identified with US at all levels. Injection of 2-ml of dye was sufficient to ensure complete staining of the ICN for 5 of 6 US-guided injections; but anatomic landmark guidance resulted in correct injection at only 2 of 6 intercostal spaces. No intravascular injection was found on dissection with either of the guidance techniques. In the 2nd phase of the study, US-guidance was associated with a higher rate of intercostal spread of 1 ml of contrast dye on fluoroscopy compared with anatomic landmarks guidance (97 % versus 70 %; p = 0.017). The authors concluded that US conferred higher accuracy and allowed use of lower volumes of injectate compared with anatomic landmarks as a guidance method for ICN injections in cadavers. They stated that US may be a viable alternative to anatomic landmarks as a guidance method for ICN injections. This was a cadaveric study.

Thallaj et al (2015) tested the hypothesis that identification and blockade of the intercosto-brachial nerve (ICBN) can be achieved under US guidance using a small volume of local anesthetic. A total of 28 adult male volunteers were examined; ICBN blockade was performed using 1-ml of 2 % lidocaine under US guidance. A sensory map of the blocked area was developed relative to the medial aspect of the humeral head. The ICBN appeared as a hyper-echoic structure. The
nerve diameter was 2.3 ± 0.28 mm, and the depth was 9 ± 0.28 mm. The measurements of the sensory-blocked area relative to the medial aspect of the humeral head were as follows: 6.3 ± 1.6 cm anteriorly; 6.2 ± 2.9 cm posteriorly; 9.4 ± 2.9 cm proximally; and 9.2 ± 4.4 cm distally; ICBN blockade using 1-ml of local anesthetic was successful in all cases. The authors concluded that the present study described the sonographic anatomical details of the ICBN and its sensory distribution to successfully perform selective US-guided ICBN blockade. These investigators stated that the volunteers in this study were all men and had a normal or low BMI; therefore, the observation might not be accurate for patients with a higher BMI or who are female. They recommended further studies to support and apply these findings to improve patient care.

In a pilot study, Wijayasinghe et al (2016) examined the feasibility of ICBN blockade and evaluated its effects on pain and sensory function in patients with persistent pain after breast cancer surgery (PPBCS). This prospective pilot study was performed in 2 parts: Part 1 determined the sono-anatomy of the ICBN; and part 2 examined effects of the US-guided ICBN blockade in patients with PPBCS. Part 1: 16 un-operated, pain-free BC patients underwent systematic US to establish the sono-anatomy of the ICBN. Part 2: 6 patients with PPBCS who had pain in the axilla and upper arm were recruited for the study. Summed pain intensity (SPI) scores and sensory function were measured before and 30 mins after the block was administered; SPI is a combined pain score of NRS at rest, movement, and 100 kPa pressure applied to the maximum point of pain using pressure algometry (max = 30). Sensory function was measured using quantitative sensory testing, which consisted of sensory mapping, thermal thresholds, supra-threshold heat pain perception as well as heat and pressure pain thresholds. The ICBN block was performed under US guidance and 10-ml 0.5 % bupivacaine was injected. Outcome measures were the ability to perform the ICBN block and its analgesic and sensory effects. Only the 2nd intercostal space could be seen on US, which was adequate to perform the ICBN block. The mean difference in SPI was -9 NRS points (95 % CI: -14.1 to -3.9, p = 0.006). All patients had pre-existing areas of hypoesthesia that decreased in size in 4/6 patients after the block. The authors concluded that they had successfully managed to block the ICBN using US guidance and demonstrated an analgesic effect in patients in PPBCS. The authors stated that the main drawback of this pilot study was its small sample size (n= 6), but despite this, a statistically significant effect was observed. They suggested that a RCT is needed to ascertain the role of ICBN blockade in PPBCS.
Intra-Articular Steroid Injection for the Knee

An UpToDate review on “Intraarticular and soft tissue injections: What agent(s) to inject and how frequently?” (Roberts, 2019) does not mention the utility of imaging guidance (i.e., arthrogram/fluoroscopic/ultrasound).

Lumbar Plexus Block with Hydrodissection

Lam et al (2017) stated that deep nerve hydrodissection uses fluid injection under pressure to separate nerves from areas of suspected fascial compression, which are increasingly viewed as potential perpetuating factors in recalcitrant neuropathic pain/complex regional pain. The usage of 5 % dextrose water (D5W) as a primary injectate for hydrodissection, with or without low-dose anesthetic, could limit anesthetic-related toxicity. An analgesic effect of D5W upon perineural injection in patients with chronic neuropathic pain has recently been described. These researchers described US-guided methods for hydrodissection of deep nerve structures in the upper torso, including the stellate ganglion, brachial plexus, cervical nerve roots, and paravertebral spaces. They retrospectively reviewed the outcomes of 100 hydrodissection treatments in 26 consecutive cases with a neuropathic pain duration of 16 ± 12.2 months and the mean Numeric Pain Rating Scale (NPRS; 0 to 10 pain level) of 8.3 ± 1.3. The mean percentage of analgesia during each treatment session involving D5W injection without anesthetic was 88.1 % ± 9.8 %. The pre-treatment NPRS score of 8.3 ± 1.3 improved to 1.9 ± 0.9 at 2 months after the last treatment. Patients received 3.8 ± 2.6 treatments over 9.7 ± 7.8 months from the 1st treatment to the 2-month post-treatment follow-up. Pain improvement exceeded 50 % in all cases and 75 % in half. The authors concluded that these findings confirmed the analgesic effect of D5W injection and suggested that hydrodissection using D5W provided cumulative pain reduction. These preliminary findings need to be validated by well-designed studies.

Median Nerve Block for Carpal Tunnel Injection

Lewis et al (2015) noted that peripheral nerve blocks can be performed using US guidance. It is unclear if this method of nerve location has benefits over other existing methods. This review was originally published in 2009 and was updated in 2014. The objective of this Cochrane review was to examine if the use of US to guide peripheral nerve blockade has any advantages over other methods of peripheral nerve location. Specifically, these researchers examined if the use of
US guidance improved success rates and effectiveness of regional anesthetic blocks, by increasing the number of blocks that were assessed as adequate, and reduced the complications, such as cardio-respiratory arrest, pneumothorax or vascular puncture, associated with the performance of regional anesthetic blocks. The authors concluded that there was evidence that peripheral nerve blocks performed by US guidance alone, or in combination with PNS, were superior in terms of improved sensory and motor block, reduced need for supplementation and fewer minor complications reported. Using US alone shortened performance time when compared with nerve stimulation, but when used in combination with PNS it increased performance time. The authors were unable to determine whether these findings reflect the use of US in experienced hands and it was beyond the scope of this review to consider the learning curve associated with peripheral nerve blocks by US technique compared with other methods.

In a Cochrane review, Guay et al (2019) examined if US guidance offers any clinical advantage when neuraxial and peripheral nerve blocks are performed in children in terms of decreasing failure rate or the rate of complications. The authors concluded that US guidance for regional blockade in children probably decreased the risk of failed block. It increased the duration of the block and probably decreased pain scores at 1 hour after surgery; there may be little or no difference in the risks of some minor complications. These investigators stated that the 5 ongoing studies may alter the conclusions of the review once published and assessed.

Platelet-Rich Plasma Injections in the Treatment of Hip Osteoarthritis

Ali and colleagues (2018) examined if US-guided platelet-rich plasma (PRP) injection has any role in improving clinical outcomes in patients with hip osteoarthritis (OA). These investigators carried out a search of the National Institute for Health and Care Excellence database using the Healthcare Databases Advanced Search tool. The PubMed database was also utilized to search the Medical Literature Analysis and Retrieval System Online, Excerpta Medica database, Cumulative Index of Nursing and Allied Health and Allied and Complimentary Medicine databases. The Preferred Reporting Items for Systematic Review and Meta-Analysis methodology guidance was employed and a quality assessment was performed using the Jadad score. A total of 3 randomized clinical trials met the inclusion criteria and were included for analysis. All 3 studies were of good quality based on the Jadad score. A total of 115 patients out of 254 received
PRP injections under US guidance. The PRP recipient group included 61 men and 54 women aged 53 to 71 years. Outcome scores showed an improvement of symptoms and function maintained up to 12 months following PRP injection. The authors concluded that available evidence indicated that intra-articular PRP injections of the hip, performed under US guidance to treat hip OA, were well-tolerated and potentially effective in delivering long-term and clinically significant pain reduction and functional improvement in patients with hip OA. Moreover, these researchers stated that larger future trials including a placebo group are needed to further evaluate these promising findings.

Subtalar Joint Injection

Reach et al (2009) stated that US is an emerging imaging modality that affords dynamic, real-time, cost-effective and surgeon controlled visualization of the foot and ankle. These researchers evaluated the accuracy of US-guided injections for common injection sites in the foot and ankle. In 10 fresh cadaver feet, US guidance was utilized to inject a methylene blue-saline mixture into the 1st metatarsophalangeal (MTP) joint, the 2nd MTP joint, the tibio-talar joint, the Achilles peritendinous space, the flexor hallucis longus sheath, the posterior tibial tendon sheath, and the subtalar joint. Dissection was then undertaken to assess injection accuracy; US guidance allowed the avoidance of intervening neurovascular and tendinous structures; US-guided MTP, ankle, Achilles, PTT and FHL peritendinous injections were 100% accurate; US-guided subtalar injection was 90% accurate. The authors concluded that US appeared to be a highly accurate method of localizing injections into a variety of locations in the foot and ankle. These investigators stated that US’s ability to display soft-tissue structures may be an advantage over blind injection and fluoroscopic injection techniques. This was a cadaveric study.

Khosla et al (2009) noted that US has been increasingly utilized in procedures involving intra-articular injections. These researchers compared the accuracy of intra-articular injections of the foot and ankle using palpation versus dynamic US in a cadaver model. A total of 14 lightly embalmed cadaver specimens without notable OA were used. A 0.22-G needle was placed by a foot and ankle orthopedic surgeon into the 1st and 2nd tarsometatarsal (TMT) joints, subtalar joint, and ankle joint. The needle was initially placed using palpation, evaluated with US by an experienced rheumatologist, and re-inserted if necessary. Needle placement was confirmed with injection of an Omnipaque/methylene blue solution and examined.
under fluoroscopy, followed by dissection. Palpation and US were 100% accurate in subtalar and ankle joint injections. Using palpation, the needle was correctly placed into the 1st TMT joint in 3 of 14 cadavers, and in 4 of 14 cadavers for the 2nd TMT joint. Using US, the needle was correctly placed into the 1st TMT joint in 10 of 14 cadavers, and into the 2nd TMT joint in 8 of 14 cadavers. When grouped, US was significantly more accurate for intra-articular needle placement compared to palpation in the mid-foot (p = 0.003). On 3 specimens, dye extended beyond the 2nd TMT joint. The authors concluded that intra-articular injections of the subtalar and ankle joints could be successfully performed utilizing palpation alone; US guidance significantly increased injection accuracy into the TMT joints compared to palpation alone and therefore US or fluoroscopy was performed when injecting these TMT joints. When using selective diagnostic injections into a TMT joint to assess for the symptomatic joint and potential need for arthrodesis, the injected anesthetic may not remain isolated within that joint. These isolated TMT injections should not be done to answer that question without fluoroscopy confirmation with radiopaque dye demonstrating the injected fluid remained within the one joint of interest.

**Superior Cluneal Nerve Injection**

Bodner et al (2016) stated that LBP is a disabling and common condition, whose etiology often remains unknown. A suggested, however rarely considered, cause is neuropathy of the medial branch of the superior cluneal nerves (mSCN) -- either at the level of the originating roots or at the point where it crosses the iliac crest, where it is ensheathed by an osseo-ligamentous tunnel. Diagnosis and treatment have, to-date, been restricted to clinical assessment and blind infiltration with local anesthetics. In an interventional cadaver study and case-series study, these investigators examined if visualization and assessment of the mSCN with high-resolution US (HRUS) is feasible. Visualization of the mSCN was assessed in 7 anatomic specimens, and findings were confirmed by HRUS-guided ink marking of the nerve and consecutive dissection. In addition, a patient chart and image review was performed of patients assessed at the authors’ department with the diagnosis of mSCN neuropathy. The mSCN could be visualized in 12 of 14 cases in anatomical specimens, as confirmed by dissection; 9 patients were diagnosed with mSCN syndrome of idiopathic or traumatic origin. Diagnosis was confirmed in all of them, with complete resolution of symptoms after HRUS-guided selective nerve block. The authors concluded that it is possible to visualize the mSCN in the majority of anatomical specimens. The patients described may indicate a higher
incidence of mSCN syndrome than has been recognized; and mSCN syndrome should be considered in patients with LBP of unknown origin, and HRUS may be able to facilitate nerve detection and US-guided nerve block. Moreover, these researchers stated that these findings were first results that need to be evaluated in a systematic, prospective and controlled manner.

**Tendon Injection**

Juel et al (2013) established a method for injecting corticosteroid into the rotator interval under US guidance and measured the effect on function, pain and ROM after 4 and 12 weeks. This study involved a multi-center cohort trial and was carried out at out-patient clinics of the physical medicine and rehabilitation departments in Norway. A total of 39 patients with adhesive capsulitis lasting between 3 and 12 months were included in this trial; US-guided corticosteroid and lidocaine injection into the rotator interval medial to the biceps tendon using 20-mg triamcinolone hexacetat and 3-ml 20 mg/ml xylocaine. Change in the shoulder pain and disability index score (SPADI) after 12 weeks was recorded. The change in SPADI was 42 points (95 % CI: 33 to 51). Changes in the secondary outcomes showed highly statistically significant increase in active and passive ROM. One US-guided corticosteroid injection into the rotator interval appeared to give significant improvement in SPADI and active ROM after 12 weeks. The authors concluded that this study was regarded as regular clinical procedure as injections with triamcinolone already is standard treatment. This was a small study (n = 39) with short-term follow-up (12 weeks).

Wheeler et al (2016) compared outcomes after 2 different high-volume image-guided injection (HVIGI) procedures performed under direct US guidance in patients with chronic non-insertional Achilles tendinopathy. In group A, HVIGI involved high-volume (10-ml of 1 % lidocaine combined with 40-ml of saline) and no dry needling. In group B, HVIGI involved a smaller volume (10-ml of 1 % lidocaine combined with 20-ml of saline) and dry needling of the Achilles tendon. A total of 34 patients were identified from the clinical records, with mean age of 50.6 (range of 26 to 83) years and mean follow-up duration of 277 (range of 49 to 596) days. The change between the pre-injection and post-injection Victorian Institute of Sports Assessment-Achilles scores of 33.4 ± 22.5 points in group A and 6.94 ± 22.2 points in group B, was statistically significant (p = 0.002). In group A, 3 patients (16.7 %) required surgical treatment compared with 6 patients (37.5 %) in group B requiring surgical treatment (p = 0.180). The authors concluded the findings of this
study indicated that a higher volume without dry needling compared with a lower volume with dry needling resulted in greater improvement in non-insertional Achilles tendinopathy. However, confounding factors meant it was not possible to state that this difference was solely due to different injection techniques. This was a small study (n = 34); its findings need to be validated by well-designed studies.

Mardani-Kivi et al (2018) compared clinical results of US-guided corticosteroid injection, intra-sheath versus extra-sheath of the finger flexor tendon. A total of 166 patients with trigger finger were evaluated in a triple-blind, randomized clinical trial study. All the patients were injected with 1-ml of 40 mg/ml methyl prednisolone acetate, under US-guidance; 50 % the patients were injected extra-sheath, while the other 50 % were injected intra-sheath at the level of 1st annular pulley. The 2 groups were comparable in baseline characteristics (age, gender, dominant hand, involved hand and finger, and the symptoms duration). No significant difference was observed in the 2 groups with regards to Quinnell grading. In the final visit, 94 % of patients from each group were symptom-free. The authors concluded that results of corticosteroid injection intra-sheath or extra-sheath of the finger flexor tendon under US guidance in patients with trigger finger were comparably alike; extra-sheath injection at the level of A1 pulley was as effective as an intra-sheath administration. The main drawback of this trial was the lack of a non-US guidance comparison group.

Laurell et al (2011) noted that the ankle region is frequently involved in juvenile idiopathic arthritis (JIA) but difficult to examine clinically due to its anatomical complexity. These investigators examined the role of US of the ankle and mid-foot (ankle region) in JIA. Doppler-US detected synovial hypertrophy, effusion and hyperemia and US was used for guidance of steroid injection and assessment of treatment efficacy. A total of 40 swollen ankles regions were studied in 30 patients (median age of 6.5 years, range of 1 to 16) with JIA. All patients were assessed clinically, by US (synovial hypertrophy, effusion) and by color Doppler (synovial hyperemia) before and 4 weeks after US-guided steroid injection. US detected 121 compartments with active disease (joints, tendon sheaths and 1 ganglion cyst). Multiple compartments were involved in 80 % of the ankle regions. The talo-crural joint, posterior subtalar joint, mid-foot joints and tendon sheaths were affected in 78 %, 65 %, 30 % and 55 %, respectively; 50 active tendon sheaths were detected, and multiple tendons were involved in 12 of the ankles. US guidance allowed accurate placement of the corticosteroid in all 85 injected compartments, with a low rate of subcutaneous atrophy (4.7 %). Normalization or regression of synovial
hypertrophy was obtained in 89 %, and normalization of synovial hyperemia in 89 %.
Clinical resolution of active arthritis was noted in 72 % of the ankles. The authors concluded that US enabled exact guidance of steroid injections with a low rate of subcutaneous atrophy, and was well-suited for follow-up examinations. Normalization or regression of synovial hypertrophy and hyperemia was achieved in most cases, suggesting that US assessment prior to steroid injection, and US guidance of injections in this region would potentially improve treatment efficacy.

Young et al (2015) stated that the subtalar joint is commonly affected in children with JIA and is challenging to treat percutaneously. These researchers described the technique for treating the subtalar joint with US-guided corticosteroid injections in children and young adults with JIA and evaluated the safety of the treatment. They retrospectively analyzed 122 patients (aged 15 months to 29 years) with JIA who were referred by a pediatric rheumatologist for corticosteroid injection therapy for symptoms related to the hind-foot or ankle. In these patients the diseased subtalar joint was targeted for therapy, often in conjunction with adjacent affected joints or tendon sheaths of the ankle. They used a protocol based on age, weight and joint for triamcinolone hexacetonide or triamcinolone acetonide dose prescription. A total of 241 subtalar joint corticosteroid injections were performed under US guidance, including 68 repeat injections for recurrent symptoms in 26 of the 122 children and young adults. The average time interval between repeat injections was 24.8 months (range of 2.2 to 130.7, median of 14.2). Subcutaneous tissue atrophy and skin hypo-pigmentation were the primary complications, which occurred in 3.9 % of the injections. The authors concluded that with appropriate training and practice, the subtalar joint could be reliably and safely targeted with US-guided corticosteroid injection to treat symptoms related to JIA.

Thread Trigger Finger Release with Hydroadissection

Guo et al (2018) noted that after the thread transecting technique was successfully applied for the thread carpal tunnel release, these investigators researched using the same technique in the thread trigger finger release (TTFR). This study was designed to test the operational feasibility of the TTFR on cadavers and verify the limits of division on the 1st annular (A1) pulley to ensure a complete trigger finger release with minimal iatrogenic injuries. The procedure of TTFR was performed on 14 fingers and 4 thumbs of 4 un-embalmed cadaveric hands. After the procedures, all fingers and thumbs were dissected and visually assessed. All of the digits and thumbs demonstrated a complete A1 pulley release. There was no injury to the
neurovascular bundle (radial digital nerve in case of thumb), flexor tendon, or A2 pulley for each case. The authors concluded that this cadaveric study showed that the technique of TTFR was safe and effective, and future clinical study is needed to verify the findings of this study.

Furthermore, an UpToDate review on “Trigger finger (stenosing flexor tenosynovitis)” (Blazar and Aggarwal, 2019) does not mention thread trigger finger release as a therapeutic option.

Appendix

Note on documentation requirements: CPT guidelines state that "Ultrasound guidance procedures also require permanently recorded images of the site to be localized, as well as a documented description of the localization process, either separately or within the report of the procedure for which the guidance is utilized. Use of ultrasound, without thorough evaluation of organ(s), or anatomic region, image documentation, and final, written report, is not separately reportable".

CPT Codes / HCPCS Codes / ICD-10 Codes

Information in the [brackets] below has been added for clarification purposes. Codes requiring a 7th character are represented by "+":

<table>
<thead>
<tr>
<th>Code</th>
<th>Code Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ultrasonic guidance for needle placement:</td>
</tr>
<tr>
<td></td>
<td>CPT codes covered if selection criteria are met:</td>
</tr>
<tr>
<td>76942</td>
<td>Ultrasonic guidance for needle placement (eg, biopsy, aspiration, injection, localization device), imaging supervision and interpretation</td>
</tr>
<tr>
<td>76998</td>
<td>Ultrasonic guidance, intraoperative</td>
</tr>
<tr>
<td></td>
<td>CPT codes for procedures where 76942 and 76998 are covered if selection criteria are met: (not all inclusive):</td>
</tr>
<tr>
<td>20526</td>
<td>Injection, therapeutic (eg, local anesthetic, corticosteroid), carpal tunnel</td>
</tr>
<tr>
<td>25000</td>
<td>Incision, extensor tendon sheath, wrist (eg, deQuervains disease)</td>
</tr>
<tr>
<td>27345</td>
<td>Excision of synovial cyst of popliteal space (eg, Baker’s cyst)</td>
</tr>
<tr>
<td>31717</td>
<td>Catheterization with bronchial brush biopsy</td>
</tr>
<tr>
<td>32096</td>
<td>Thoracotomy, with diagnostic biopsy(ies) of lung infiltrate(s) (eg, wedge, incisional), unilateral</td>
</tr>
<tr>
<td>Code</td>
<td>Code Description</td>
</tr>
<tr>
<td>---------</td>
<td>---------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>32097</td>
<td>Thoracotomy, with diagnostic biopsy(ies) of lung nodule(s) or mass(es) (eg, wedge, incisional), unilateral</td>
</tr>
<tr>
<td>32098</td>
<td>Thoracotomy, with biopsy(ies) of pleura</td>
</tr>
<tr>
<td>32400</td>
<td>Biopsy, pleura, percutaneous needle</td>
</tr>
<tr>
<td>32405</td>
<td>Biopsy, lung or mediastinum, percutaneous needle</td>
</tr>
<tr>
<td>32607</td>
<td>Thoracoscopy; with diagnostic biopsy(ies) of lung infiltrate(s) (eg, wedge, incisional), unilateral</td>
</tr>
<tr>
<td>32608</td>
<td>with diagnostic biopsy(ies) of lung nodule(s) or mass(es) (eg, wedge, incisional), unilateral</td>
</tr>
<tr>
<td>32609</td>
<td>with biopsy(ies) of pleura</td>
</tr>
<tr>
<td>47000</td>
<td>Biopsy of liver, needle; percutaneous</td>
</tr>
<tr>
<td>+47001</td>
<td>when done for indicated purpose at time of other major procedure (List separately in addition to code for primary procedure)</td>
</tr>
<tr>
<td>47100</td>
<td>Biopsy of liver, wedge</td>
</tr>
<tr>
<td>48100</td>
<td>Biopsy of pancreas, open (eg, fine needle aspiration, needle core biopsy, wedge biopsy)</td>
</tr>
<tr>
<td>48102</td>
<td>Biopsy of pancreas, percutaneous needle</td>
</tr>
<tr>
<td>49180</td>
<td>Biopsy, abdominal or retroperitoneal mass, percutaneous needle</td>
</tr>
<tr>
<td>49321</td>
<td>Laparoscopy, surgical; with biopsy (single or multiple)</td>
</tr>
<tr>
<td>50040 - 50081</td>
<td>Incision, renal</td>
</tr>
<tr>
<td>50220 - 50240</td>
<td>Excision, renal</td>
</tr>
<tr>
<td>50384 - 50386</td>
<td>Introduction, renal</td>
</tr>
<tr>
<td>50390 - 50431, 50433, 50435</td>
<td>Other Introduction, renal</td>
</tr>
<tr>
<td>50541, 50543 - 50549</td>
<td>Laparoscopy, renal</td>
</tr>
<tr>
<td>50590 - 50593</td>
<td>Lithotripsy</td>
</tr>
<tr>
<td>55700</td>
<td>Biopsy, prostate; needle or punch, single or multiple, any approach</td>
</tr>
<tr>
<td>55705</td>
<td>incisional, any approach</td>
</tr>
<tr>
<td>58974</td>
<td>Embryo transfer, intrauterine</td>
</tr>
<tr>
<td>58976</td>
<td>Gamete, zygote, or embryo intrafallopian transfer, any method</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>60100</td>
<td>Biopsy thyroid, percutaneous core needle</td>
</tr>
<tr>
<td>62270</td>
<td>Spinal puncture, lumbar, diagnostic</td>
</tr>
<tr>
<td>62272</td>
<td>Spinal puncture, therapeutic, for drainage of cerebrospinal fluid (by needle or catheter)</td>
</tr>
<tr>
<td>62350</td>
<td>Implantation, revision or repositioning of tunneled intrathecal or epidural catheter, for long-term medication administration via an external pump or implantable reservoir/infusion pump; without laminectomy</td>
</tr>
<tr>
<td>62351</td>
<td>with laminectomy</td>
</tr>
<tr>
<td>62360</td>
<td>Implantation or replacement of device for intrathecal or epidural drug infusion; subcutaneous reservoir</td>
</tr>
<tr>
<td>62361</td>
<td>nonprogrammable pump</td>
</tr>
<tr>
<td>62362</td>
<td>programmable pump, including preparation of pump, with or without programming</td>
</tr>
<tr>
<td>64413</td>
<td>Injection, anesthetic agent; cervical plexus [Interscalene nerve block] and [Supraclavicular nerve block for post-operative pain control]</td>
</tr>
<tr>
<td>64415</td>
<td>brachial plexus, single [Interscalene nerve block] and [Supraclavicular nerve block for post-operative pain control]</td>
</tr>
<tr>
<td>64416</td>
<td>brachial plexus, continuous infusion by catheter (including catheter placement [Interscalene nerve block] and [Supraclavicular nerve block for post-operative pain control]</td>
</tr>
<tr>
<td>64445</td>
<td>sciatic nerve, single</td>
</tr>
<tr>
<td>64446</td>
<td>sciatic nerve, continuous infusion by catheter (including catheter placement)</td>
</tr>
<tr>
<td>64447</td>
<td>femoral nerve, single arterial line placement</td>
</tr>
<tr>
<td>64448</td>
<td>femoral nerve, continuous infusion by catheter (including catheter placement)</td>
</tr>
<tr>
<td>64450</td>
<td>other peripheral nerve or branch [femoral nerve block for post-operative knee pain] and [quadratus lumborum nerve block for post-operative pain control after abdominal surgery]</td>
</tr>
<tr>
<td>92928</td>
<td>Percutaneous transcatheter placement of intracoronary stent(s), with coronary angioplasty when performed; single major coronary artery or branch</td>
</tr>
<tr>
<td>Code</td>
<td>Code Description</td>
</tr>
<tr>
<td>--------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>+92929</td>
<td>each additional branch of a major coronary artery (List separately in addition to code for primary procedure)</td>
</tr>
<tr>
<td>92933</td>
<td>Percutaneous transluminal coronary atherectomy, with intracoronary stent, with coronary angioplasty when performed; single major coronary artery or branch</td>
</tr>
<tr>
<td>+92934</td>
<td>each additional branch of a major coronary artery (List separately in addition to code for primary procedure)</td>
</tr>
<tr>
<td>92937</td>
<td>Percutaneous transluminal revascularization of or through coronary artery bypass graft (internal mammary, free arterial, venous), any combination of intracoronary stent, atherectomy and angioplasty, including distal protection when performed; single vessel</td>
</tr>
<tr>
<td>+92938</td>
<td>each additional branch subtended by the bypass graft (List separately in addition to code for primary procedure)</td>
</tr>
<tr>
<td>92941</td>
<td>Percutaneous transluminal revascularization of acute total/subtotal occlusion during acute myocardial infarction, coronary artery or coronary artery bypass graft, any combination of intracoronary stent, atherectomy and angioplasty, including aspiration thrombectomy when performed, single vessel</td>
</tr>
<tr>
<td>92943</td>
<td>Percutaneous transluminal revascularization of chronic total occlusion, coronary artery, coronary artery branch, or coronary artery bypass graft, any combination of intracoronary stent, atherectomy and angioplasty; single vessel</td>
</tr>
<tr>
<td>+92944</td>
<td>each additional coronary artery, coronary artery branch, or bypass graft (List separately in addition to code for primary procedure)</td>
</tr>
<tr>
<td>92974</td>
<td>Transcatheter placement of radiation delivery device for subsequent coronary intravascular brachytherapy (List separately in addition to code for primary procedure)</td>
</tr>
</tbody>
</table>

CPT codes for procedures where 76942 and 76998 are not covered for indications listed in the CPB:

- Erector spinae plane (ESP) block – no specific code:
  20550 Injection(s); single tendon sheath, or ligament, aponeurosis (eg, plantar "fascia")
  20552 single or multiple trigger point(s), 1 or 2 muscle(s)
  20553 single or multiple trigger point(s), 3 or more muscles
<table>
<thead>
<tr>
<th>Code</th>
<th>Code Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>26055</td>
<td>Tendon sheath incision (eg, for trigger finger)</td>
</tr>
<tr>
<td>36465</td>
<td>Injection of non-compounded foam sclerosant with ultrasound compression maneuvers to guide dispersion of the injectate, inclusive of all imaging guidance and monitoring; single incompetent extremity truncal vein (eg, great saphenous vein, accessory saphenous vein)</td>
</tr>
<tr>
<td>36466</td>
<td>multiple incompetent truncal veins (eg, great saphenous vein, accessory saphenous vein), same leg</td>
</tr>
<tr>
<td>36470</td>
<td>Injection of sclerosant; single incompetent vein (other than telangiectasia)</td>
</tr>
<tr>
<td>36471</td>
<td>multiple incompetent veins (other than telangiectasia), same leg</td>
</tr>
<tr>
<td>64420</td>
<td>Injection, anesthetic agent; intercostal nerve, single</td>
</tr>
<tr>
<td>64421</td>
<td>intercostal nerves, multiple, regional block</td>
</tr>
<tr>
<td>64449</td>
<td>lumbar plexus, posterior approach, continuous infusion by catheter (including catheter placement)</td>
</tr>
<tr>
<td>64479</td>
<td>Injection(s), anesthetic agent and/or steroid, transforaminal epidural, with imaging guidance (fluoroscopy or CT); cervical or thoracic, single level</td>
</tr>
<tr>
<td>+64480</td>
<td>cervical or thoracic, each additional level (List separately in addition to code for primary procedure)</td>
</tr>
<tr>
<td>64483</td>
<td>lumbar or sacral, single level</td>
</tr>
<tr>
<td>+64484</td>
<td>lumbar or sacral, each additional level (List separately in addition to code for primary procedure)</td>
</tr>
</tbody>
</table>

HCPCS codes for procedures where 76942 and 76998 are not covered for indications listed in the CPB:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>J7318</td>
<td>Hyaluronan or derivative, durolane, for intra-articular injection, 1 mg</td>
</tr>
<tr>
<td>J7320</td>
<td>Hyaluronan or derivative, genvisc 850, for intra-articular injection, 1 mg</td>
</tr>
<tr>
<td>J7321</td>
<td>Hyaluronan or derivative, Hyalgan, Supartz or Visco-3, for intra-articular injection, per dose</td>
</tr>
<tr>
<td>J7322</td>
<td>Hyaluronan or derivative, hymovis, for intra-articular injection, 1 mg</td>
</tr>
<tr>
<td>J7323</td>
<td>Hyaluronan or derivative, Euflexxa, for intra-articular injection, per dose</td>
</tr>
<tr>
<td>J7324</td>
<td>Hyaluronan or derivative, Orthovisc, for intra-articular injection, per dose</td>
</tr>
<tr>
<td>Code</td>
<td>Code Description</td>
</tr>
<tr>
<td>--------</td>
<td>----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>J7325</td>
<td>Hyaluronan or derivative, Synvisc, or Synvisc-One for intra-articular injection, 1 mg</td>
</tr>
<tr>
<td>J7326</td>
<td>Hyaluronan or derivative, Gel-One, for intra-articular injection, per dose</td>
</tr>
<tr>
<td>J7327</td>
<td>Hyaluronan or derivative, Monovisc, for intra-articular injection, per dose</td>
</tr>
<tr>
<td>J7328</td>
<td>Hyaluronan or derivative, for intra-articular injection, 0.1 mg [Gel-Syn]</td>
</tr>
</tbody>
</table>

Ultrasound guidance for vascular access:

CPT codes covered if selection criteria are met:

+76937  | Ultrasound guidance for vascular access requiring ultrasound evaluation of potential access sites, documentation of selected vessel patency, concurrent realtime ultrasound visualization of vascular needle entry, with permanent recording and reporting (List separately in addition to code for primary procedure) |

76998  | Ultrasonic guidance, intraoperative                                                |

CPT codes for procedures where 76937 and 76998 are covered if selection criteria are met (not all inclusive):

36555  | Insertion of non-tunneled centrally inserted central venous catheter; younger than 5 years of age |
<p>| 36556  | age 5 years or older                                                                |
| 36557  | Insertion of tunneled centrally inserted central venous catheter, without subcutaneous port or pump; younger than 5 years of age |
| 36558  | age 5 years or older                                                                |
| 36560  | Insertion of tunneled centrally inserted central venous access device, with subcutaneous port; younger than 5 years of age |
| 36561  | age 5 years or older                                                                |
| 36563  | Insertion of tunneled centrally inserted central venous access device with subcutaneous pump |
| 36565  | Insertion of tunneled centrally inserted central venous access device, requiring 2 catheters via 2 separate venous access sites; without subcutaneous port or pump (eg, Tesio type catheter) |
| 36566  | with subcutaneous port(s)                                                           |
| 36570  | Insertion of peripherally inserted central venous access device, with subcutaneous port; younger than 5 years of age |
| 36571  | age 5 years or older                                                                |</p>
<table>
<thead>
<tr>
<th>Code</th>
<th>Code Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>36575</td>
<td>Repair of tunneled or non-tunneled central venous access catheter, without subcutaneous port or pump, central or peripheral insertion site</td>
</tr>
<tr>
<td>36576</td>
<td>Repair of central venous access device, with subcutaneous port or pump, central or peripheral insertion site</td>
</tr>
<tr>
<td>36578</td>
<td>Replacement, catheter only, of central venous access device, with subcutaneous port or pump, central or peripheral insertion site</td>
</tr>
<tr>
<td>36580</td>
<td>Replacement, complete, of a non-tunneled centrally inserted central venous catheter, without subcutaneous port or pump, through same venous access</td>
</tr>
<tr>
<td>36581</td>
<td>Replacement, complete, of a tunneled centrally inserted central venous catheter, without subcutaneous port or pump, through same venous access</td>
</tr>
<tr>
<td>36582</td>
<td>Replacement, complete, of a tunneled centrally inserted central venous access device, with subcutaneous port, through same venous access</td>
</tr>
<tr>
<td>36583</td>
<td>Replacement, complete, of a tunneled centrally inserted central venous access device, with subcutaneous pump, through same venous access</td>
</tr>
<tr>
<td>36585</td>
<td>Replacement, complete, of a peripherally inserted central venous access device, with subcutaneous port, through same venous access</td>
</tr>
<tr>
<td>36589</td>
<td>Removal of tunneled central venous catheter, without subcutaneous port or pump</td>
</tr>
<tr>
<td>36590</td>
<td>Removal of tunneled central venous access device, with subcutaneous port or pump, central or peripheral insertion</td>
</tr>
<tr>
<td>50040 - 50081</td>
<td>Incision, renal</td>
</tr>
<tr>
<td>50220 - 50240</td>
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<td>50590 - 50593</td>
<td>Lithotripsy</td>
</tr>
</tbody>
</table>
The above policy is based on the following references:


40. Jeng CL, Rosenblatt MA. Upper extremity nerve blocks: Techniques. UpToDate [online serial]. Waltham, MA: UpToDate; reviewed April 2019b.

41. Roberts WN, Jr. Intraarticular and soft tissue injections: What agent(s) to inject and how frequently? UpToDate [online serial]. Waltham, MA: UpToDate; reviewed April 2019.

42. Buchbinder R. Plantar fasciitis. UpToDate [online serial]. Waltham, MA: UpToDate; reviewed April 2019.

43. Blazar PE, Aggarwal R. Trigger finger (stenosing flexor tenosynovitis). UpToDate [online serial]. Waltham, MA: UpToDate; reviewed April 2019.

44. Salama ER. Ultrasound guided bilateral quadratus lumborum block vs. intrathecal morphine for postoperative analgesia after cesarean section: A


Amendment to
Aetna Clinical Policy Bulletin Number: 0952 Ultrasound Guidance – Selected Indications

There are no amendments for Medicaid.