Irrespective of how well a primary total hip arthroplasty (THA) is performed, postoperative complications will develop in some patients. The optimal management of postoperative complications when they first occur often can prevent a cycle of further complications. This chapter reviews management strategies for the most common and difficult early postoperative complications after primary total hip arthroplasty, including wound problems, periprosthetic femur fractures, nerve dysfunction, and venous thromboembolism. State-of-the-art knowledge will help the treating surgeon successfully manage complications.

The Postoperative Wound Is Red or Draining
The most anxiety-inducing early complication of THA for the surgeon is a red and/or draining wound. This complication requires an early decision by the surgeon on whether reoperation for débridement is necessary because delay can result in an unsuccessful outcome or necessitate a two-stage exchange.
procedure for a deep infection. An objective approach should be followed.

Red Wound
For a wound that is red on postoperative days 2 through 5, the surgeon must determine whether an early wound infection is present and whether it is deep or superficial. If minimal redness is evident, the wound is not draining, and the patient exhibits no obvious signs of sepsis, observation is warranted for several days without prescribing antibiotics. In this circumstance, the patient should be followed closely either in the hospital, with outpatient visits, or by telephone communication.

If no improvement is reported and the wound is persistently red or becomes indurated, or drainage with pain or fever develops, the hip requires urgent incision and drainage. In this case, before irrigation and débridement, the surgeon may aspirate the joint through normal skin to examine the fluid, including a cell count and culture. If the synovial fluid white blood cell count is greater than 10,000 cells/μL or if the differential shows greater than 90% neutrophils, a deep infection is likely. If the aspirate appears normal, the infection may be superficial, and care should be taken to avoid opening the deep fascia during irrigation and débridement. If the deep fascia is intact, a superficial infection is indicated. Intravenous antibiotics should be administered, and an infectious disease specialist should be consulted postoperatively.

Three courses of action are available for a deep wound infection: (1) the removal of all implants and a one-stage exchange; (2) the removal of all implants, the placement of an antibiotic spacer, and delayed second-stage reimplantation; or (3) an exchange of the liner and/or head and irrigation and débridement followed by prolonged intravenous antibiotics and consultation with an infectious disease specialist. Considerable debate exists regarding the success of head and/or liner exchange, and some evidence indicates relatively poor success rates. Given these new data, the authors of this chapter favor implant removal within the first postoperative week (this should be possible without much difficulty with noncemented implants) and a one-stage exchange, which may result in a higher success rate. A deep infection occurring after 3 to 4 weeks is more problematic because the infection may be firmly established, and further studies are needed to definitively recommend liner and/or head exchange over a two-stage procedure.

Draining Wound
Almost all hip wounds have some bloody or serous drainage for several days. For drainage that persists beyond day 2, it must be determined if the cause is a sterile hematoma/seroma or the result of an early superficial or deep wound infection. With wound drainage during the hospital stay, laboratory inflammatory markers (erythrocyte sedimentation rate and C-reactive protein level) may not be helpful given the recent surgical intervention. Obtaining cultures from the wound drainage is not recommended because these cultures almost always have false-positive results for skin flora. Patient discharge should probably be delayed to observe the wound unless the patient is reliable and can return quickly if drainage persists after several more days.

With substantial wound drainage at postoperative day 3, consideration should be given to resting the hip and discontinuing anticoagulation that is being used for venous thromboembolic (VTE) prophylaxis. The drainage should be treated with occlusive sterile dressing changes, but antibiotics should probably not be started because they are unlikely to prevent an infection and could result in a superinfection caused by more virulent organisms.

For persistent drainage with the presence of an obvious hematoma (deep or superficial) between postoperative days 3 through 5, immediate irrigation and débridement and hematoma evacuation should be performed. Anticoagulation should be reversed, if possible, and mechanical VTE prophylaxis should be used. The use of any of the three oral factor Xa inhibitors may be problematic because of the inability to reverse them. Some studies using these new drugs have reported an increased rate of wound complications compared with that of low-molecular-weight heparin, and none of the comparative studies have shown lower rates of bleeding complications with the factor Xa inhibitors than with low-molecular-weight heparin. Cultures of the hematoma should be performed at irrigation and débridement. A schematic algorithm for the treatment of draining wounds after hip arthroplasty is presented in Figure 1.

Prevention of a Red or Draining Wound After THA
Prophylactic antibiotics given before joint arthroplasty procedures (including THA) is standard care, and careful nontraumatic surgical technique is very important. The use of smaller incisions can result in problems, including the inability to attain hemostasis because of poor visualization and/or maceration of skin edges resulting from the insertion
of reamers and broaches. Although no evidence exists that wound irrigation is imperative, using saline, diluted betadine, or very diluted chlorhexidine to flush the wound before closure can decrease the bacterial load within the wound and may decrease the infection rate.

Retention sutures, as advocated by Charnley, reduce the incidence of seroma in patients who are obese and in those whose wounds may be difficult to seal because of chronic corticosteroid use or poor nutrition. Chlorhexidine gluconate solutions are better than older antiseptic agents such as betadine and iodine. Sealing the skin from the wound with an antimicrobial incision drape can decrease the amount of bacterial contamination from the skin (removing the prep solution from the incision line before applying this adhesive drape with alcohol results in an impenetrable barrier for skin flora). Tranexamic or epsilon-aminocaproic acid has been proven to reduce bleeding after hip arthroplasty and may help decrease the occurrence of a hematoma.

The use of mechanical VTE prophylaxis may reduce the risk of postoperative bleeding and wound complications after joint arthroplasty. Recent studies have reported on the efficacy of a mobile intermittent pneumatic compression device used intraoperatively and for 10 days postoperatively and indicated that this type of mechanical prophylaxis may be as effective as chemoprophylaxis without the risk of bleeding. A combination of prophylactic prevention methods can be helpful in this high-risk population and include occlusive negative-pressure dressings, meticulous hemostasis, tranexamic acid, deep and superficial drains, and wound irrigation.

Even if a wound is found to be sterile, it is difficult to criticize the decision to perform early irrigation and débridement for a suspected infection or draining hematoma or seroma. In contrast, delaying surgical treatment of a red or draining wound with the assumption that it will improve spontaneously or cease draining poses the risk for a possible deep prosthetic joint infection if the wound does not heal.

### Early Postoperative Periprosthetic Femoral Fractures

Given that noncemented stems are commonly used in primary THA, the prevalence of intraoperative and early postoperative fractures of the femur has increased. Although initial press-fit fixation is required for osteointegration, a fine balance exists between optimizing initial stability and overloading the strength of the proximal femur. The risk of intraoperative fracture is intimately related to the design of the femoral component used and the strength of the bone into which it is placed.

Noncemented femoral components that are fixed primarily in the metaphysis are typically associated with the highest risk, particularly those with a flat-wedge tapered design in which the loading forces are more concentrated over a smaller surface area (Figure 2). The quantity and quality of proximal femoral bone also is important because these factors determine fracture resistance. Patients who are smaller, elderly, and female are typically at highest risk, as are patients with dysplasia because the proximal femoral anatomy may be distorted. Adequate visualization is critically important, and the entire proximal femur generally should be visible to inspect for minimally or nondisplaced fractures.

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**Figure 1** Algorithm for draining a serous hip wound after total hip arthroplasty.
fractures. Forceful broaching is discouraged, and the surgeon should cease hitting the broach or implant after it fails to advance with successive mallet strikes. If the final implant advances beyond a depth where the femur was broached, a fracture should be suspected, even if it is not readily visible.

If a fracture is suspected intraoperatively, the stem (or the broach) should be removed and the fracture examined to determine its extent and the stability of the proximal femur. Fractures appear to occur most commonly during final implant insertion because the stem is generally somewhat larger than the broach and/or trial used. Most fractures are nondisplaced after implant removal. At this time, the surgeon can either place a cerclage wire or a cable around the proximal femur and reinsert the stem, or, alternatively, switch to a femoral component with primary diaphyseal fixation.

For a patient who presents with a periprosthetic femur fracture in the early postoperative period, recognizing that the femoral component is loose and requires revision (similar to a Vancouver B2 fracture) is of the highest importance. In general, these fractures are managed with revision to a stem with primary diaphyseal fixation; the metaphysis should not be relied on for primary fixation.

This chapter’s authors have observed a high rate of complications when managing this type of periprosthetic fracture. In a consecutive series of 5,313 primary THAs, 32 hips (0.6%) underwent surgery for a periprosthetic fracture within the first 90 days postoperatively. Seven of 21 Vancouver B2 fractures (33%) that were treated with a diaphyseal femoral component sustained complications, most commonly deep infection and heterotopic bone formation, although additional complications observed included instability and failure of fixation of the revision component. Deep infection is of particular concern because other studies have corroborated a higher risk of periprosthetic joint infection in patients undergoing early reoperation.

With any type of early reoperation, it can be difficult to obtain a sterile field secondary to prior suture material, skin glue, and scabbing and with a patient who may be malnourished from the initial procedure. Given the high risk of heterotopic bone formation observed in this series, these patients are now routinely treated prophylactically with a single dose of radiation, although oral agents also can be used.

Sciatic Nerve Injury

Epidemiology

Neurologic injury after elective THA is a devastating complication for both the patient and the surgeon and is a substantial cause of litigation in orthopaedic surgery. Although this complication cannot be completely eliminated, joint arthroplasty surgeons should be aware of preoperative characteristics and situations that elevate a patient’s risk. Neurologic injuries can be classified as either an injury to a peripheral nerve or the central nervous system. Peripheral nerve injuries can occur either near the surgical site or at a distant location such as the contralateral limb or the upper extremity. Peripheral nerve injuries near the surgical site are most common and represent a vexing problem for joint arthroplasty surgeons.

The prevalence of peripheral nerve injuries after all hip arthroplasty
Early Postoperative Problems of Primary Total Hip Arthroplasty

Chapter 28

The oral artery and vein at the level of the femoris and remains lateral to the femoral nerve is located deep to the rectus nerve injuries. Anatomically, the femoral portion of the sciatic nerve is the most commonly injured part.

Schmalzried et al 15 reported that more than 94% of sciatic nerve injuries involved the peroneal portion of the sciatic nerve, and isolated tibial nerve injuries were rare. One theory on the higher risk of damage to the peroneal portion of the sciatic nerve is that at the level of the hip, the fascicles of the peroneal division are denser, making it more susceptible to injury. Other factors that may contribute to the higher risk of injury include the proximity to retractors compared with the tibial division, the relative tethering of the nerve between the ischial tuberosity and the femoral insertion of the nerve between the sciatic notch and the fibular head, and the compression of the nerve between the ischial tuberosity and the femoral insertion of the gluteus maximus. 16,17 Preoperative risk factors for damage to the sciatic nerve include female sex, hip dysplasia, previous revision surgery, combined nerve root compression of the lumbar spine, or peripheral neuropathy. 15,18 Other series suggest that a posterior surgical approach, deficient posterior wall, excision of heterotopic bone, lengthening of the extremity, and using cementless femoral implants may result in a higher prevalence of sciatic nerve injury. 19

Femoral nerve injuries are much less common after THA; in one large series, they accounted for 13% of peripheral nerve injuries. 15 Anatomically, the femoral nerve is located deep to the rectus femoris and remains lateral to the femoral artery and vein at the level of the hip. Direct compression of the nerve is the most common etiology and can easily occur if a retractor is placed anterior to the rectus femoris. The risk of injury is greater with an anterior surgical approach, in patients with deficient anterior acetabular bone, and in those with a previously released or absent psoas tendon.

The association between superior gluteal nerve injuries and the use of a gluteal splitting approach for THA is becoming more well recognized. 20 The superior gluteal nerve innervates the gluteus medius, gluteus minimus, and tensor fascia lata. This nerve is at risk when the surgical split of the gluteus medius extends more than 5 cm beyond the tip of the greater trochanter. Although the sciatic nerve is considered the nerve most commonly injured following THA, superior gluteal injuries are likely much more common. Ramesh et al 20 reported a 23% prevalence of injury following THA using a Hardinge approach. Identifying superior gluteal injuries postoperatively is difficult because patients present with abductor weakness and a Trendelenburg gait pattern, similar to patients with an abductor avulsion.

**Treatment**

The successful treatment of any neurologic injury requires a prompt clinical diagnosis. The evaluation and documentation of the preoperative neurologic status of the patient is crucial and includes an evaluation of the patient’s mental status as well as his or her sensory and motor function in both the upper and lower extremities. A repeat examination should be performed immediately in the recovery room after the patient is able to follow commands. If an immediate postoperative neurologic examination is not performed, it is difficult to differentiate a delayed nerve injury from an injury that occurred intraoperatively. The patient and family also should be counseled immediately if a nerve injury is identified so that they can help monitor the extremity postoperatively.

Physical examination of the sciatic nerve should include both the tibial and peroneal distributions. Peroneal nerve motor function can be assessed by placing the foot in a position of neutral dorsiflexion and plantar flexion and asking the patient to raise the great toe and ankle. This assesses the function of the extensor hallucis longus and the tibialis anterior. Having the patient move his or her toes with the foot in a plantarflexed position is insufficient because rebound extension can be perceived as peroneal function. Peroneal nerve motor function can be determined by assessing sensation in the first dorsal web space. Ideally, the patient should be able to discriminate light touch as well as sharp and dull touch. For the tibial nerve, motor function can be assessed by having the patient flex the great toe and plantarflex the foot against resistance; sensory function can be assessed on the plantar surface of the foot.

The treatment of postoperative sciatic nerve palsy depends on the etiology and the time that the palsy was identified. The etiology of most sciatic nerve palsies is unknown. 15 Ultimately, the surgeon must decide if acute surgical intervention will result in a greater chance of recovery. After a sciatic nerve palsy is identified, all tight bandages, straps from an abduction pillow, or compression stockings should be removed. Patients who have received regional anesthesia (spinal or epidural anesthesia) must be monitored closely because
palsy may not be recognized if sensory and motor weakness is attributed to the residual effects of the anesthesia. All patients should be placed in a position that allows hip extension and knee flexion to minimize tension on the sciatic nerve. Postoperative radiographs can determine if substantial leg lengthening occurred at the time of surgery. In this circumstance, it has been suggested that isolated modular femoral head exchange to shorten the extremity may result in neurologic improvement. Postoperative radiographs also should be evaluated for component position and the location of any bone graft or supplemental screws. A CT scan or Judet radiograph may help identify suspected mechanical impingement. If a mechanical cause of injury is suspected, the patient should undergo revision as soon as medically feasible.

Late neurologic injury can occur because of an expanding hematoma near the surgical site or the epidural space. A patient’s thigh circumference should be evaluated and compared with the contralateral extremity. Serial measurements may demonstrate clinical signs of an expanding hematoma. The patient’s hemoglobin and level of anticoagulation also should be monitored to determine if a sudden reduction in hemoglobin or a sudden increase in the level of anticoagulation occurred. Imaging tools such as CT and ultrasonography have been used to quantify the size of a hematoma. MRI is the most sensitive study for detecting an expanding epidural hematoma. Immediate neurosurgical consultation should be considered in patients with evolving neurologic symptoms, especially if multiple nerve roots appear to be affected.

Delayed neurologic injury also can occur because of patient positioning. Hip flexion and knee extension result in a relative shortening of the sciatic nerve. Fleming et al evaluated sciatic nerve strain in 10 patients undergoing primary THA. A mean 26% increase in strain was observed during hip flexion and knee extension. This degree of strain can exceed the threshold before neuralgic symptoms become clinically apparent, especially in patients who sustained some limb lengthening as a result of surgery.

Patients with an identifiable cause for their sciatic nerve palsy should be closely monitored to ensure the neurologic insult does not progress. Bracing the foot with an ankle-foot orthosis should be started in the early postoperative period to assist with ambulation and minimize the likelihood of flexion contracture. Patients with complete sciatic nerve palsy must be counseled on the importance of skin care to minimize the risk of ulceration. Electromyography and nerve conduction velocity studies should be considered in patients with residual motor or sensory defects at 4 to 6 weeks. These studies help identify the location of the injury and provide a baseline level of function. Many patients with sciatic nerve palsy may report painful dyesthesia. Collaboration with a physician specializing in chronic pain management may be helpful if other modalities, such as tricyclic antidepressants or gabapentin, are being considered.

The treatment of femoral nerve palsy also depends on its etiology. Observation is generally recommended because most femoral nerve palsies are caused by excessive retraction during the surgical approach. Other inciting causes, such as impingement from cement, a bone screw, or an expanding hematoma, must be considered. Femoral nerve palsy can cause profound quadriceps weakness, resulting in difficulty with ambulation. In these situations, a long-leg drop-lock brace can be beneficial until the patient’s motor strength improves.

The clinical outcome after a nerve injury depends on the etiology and severity of the injury as well as patient-related factors. The specific nerve injured, the degree of the injury, the zone of the injury, the distance from the injury to the end organ, and the environment surrounding the nerve all have been shown to be important prognostic indicators for recovery. Patient-related factors include age, neurologic comorbidities (such as diabetes, lumbar spine disease, and alcoholism), and medical comorbidities (such as smoking and steroid use) also are important. Farrell et al reported a 36% rate of complete motor strength recovery in patients who initially had complete loss of motor function or sensation. Only 39% of patients who initially had a partial loss of motor strength demonstrated complete recovery.

Schmalzried et al evaluated 228 nerve palsies and reported that 41% of the patients were asymptomatic, 44% had mild residual deficits, and 15% had major deficits. The return of some motor function and the presence of some sensory function within the first 2 weeks postoperatively appear to be good prognostic indicators. The outcome of femoral nerve palsies is controversial. Although some authors believe the prognosis for recovery is better with a femoral nerve injury compared with a sciatic nerve injury, others have reported a low prevalence of complete recovery.

Prevention
The risk of peripheral nerve injury after THA cannot be eliminated. However,
pain. The posterior superior quadrant described by Wasielewski et al 25 can commonly supplement initial component fixation. The quadrant system described by Wasielewski et al25 can identify a safe zone for screw placement. The posterior superior quadrant minimizes the chance of neurovascular compromise and is recommended for routine primary THA.

Limb lengthening undoubtedly places a nerve at an increased risk of injury. The limb may either be lengthened inadvertently during THA or intentionally in a situation such as hip dysplasia, congenital leg-length inequality, or prior trauma. Patient comorbidities (such as diabetes, smoking history, and associated peripheral neuropathy), the chronicity of the shortened extremity, and the amount of intraoperative lengthening all are important risk factors for nerve injury. A patient who sustained a traumatic event that resulted in leg-length inequality is at lower risk for neurologic injury than a patient with a congenital short limb because the nerve in the traumatically injured patient was normal length at one time. It has been suggested that a limb can be lengthened either 4 cm or 6% of its length without causing a sensory/motor deficit.26 Other surgeons have found no statistical correlation between the amount of limb lengthening and the incidence of nerve injury.27 A subtrochanteric shortening osteotomy should be considered in patients with hip dysplasia if excessive limb lengthening is anticipated. If lengthening is desired to augment stability, trochanteric advancement should be considered to improve soft-tissue tension while decreasing the need for limb lengthening.

Strategies to Minimize Nerve Injury

Preoperative counseling is crucial in clinical scenarios that place a patient at increased risk of neurologic injury. Preoperative knowledge of the potential for postoperative sensory or motor loss not only helps the patient make an informed decision but also prepares the patient if an injury occurs. Although all preexisting medical comorbidities and neurologic injuries should be optimized before surgery, the risk attributed to these conditions remains static. Risk factors that can be minimized include appropriate preoperative templating to avoid inadvertent limb lengthening, placing femoral and acetabular retractors against bone throughout the procedure, and maintaining the limb in a position that minimizes tension on the nerve during times of greatest risk during the procedure. Surgeons also should be aware of safe positions to place acetabular screws and should avoid plunging during drilling of the bone. A thorough neurologic examination after the surgical procedure is crucial to promptly identify a postoperative neurologic injury. Successful long-term recovery of any nerve palsy depends on the timing of recognition and early intervention if a cause can be identified.

Pulmonary Embolism and Symptomatic Deep Vein Thrombosis

The obvious challenge of managing the infrequent occurrence of clinically meaningful thromboembolic events during the initial hospitalization is balancing the risks and benefits of converting low-intensity VTE disease prophylaxis to more intensive therapeutic anticoagulation in the acute perioperative setting when the risk of bleeding is highest. The authors of this chapter consider an early event to be one that occurs within 5 to 7 days postoperatively, during the period of routine VTE disease prophylaxis but typically after discharge from the hospital. When the thromboembolic event occurs during the initial hospitalization,
the considerations implicit in balancing the effects of full-intensity anticoagu-
lation have even greater consequences be-
cause the bleeding risk is greater the
sooner the anticoagulation occurs after
the procedure. In addition, the sur-
egon will more likely be included in the
discussion of treatment options when
the event occurs during the initial hos-
pitalization. Although the surgeon may
be uncomfortable or even reluctant to
get involved in discussions of medical
treatment of the patient, the surgical
team has invaluable perspective about
bleeding complications. Therefore, it
is imperative that the surgical team re-
main actively involved in the care of the
patient who has experienced a throm-
boembolic event after THA to ensure
a circumspect discussion of the poten-
tial risks and benefits of implementing
full-intensity therapeutic anticoagu-
lation in the early perioperative period.

Classically, VTE disease after
THA requires anticoagulant therapy
and/or a vena cava filter to reduce the
risk of a fatal pulmonary embolism
(PE). This is based on the assumption
that approximately 20% of postopera-
tive calf thrombi will propagate prox-
imally to the thigh and 50% of those
proximal thrombi will move to the
lung. Proximal thrombi (above the
venous trifurcation in the calf) have
the greatest embolic potential of lower
limb clots and historically predominate
over calf thrombi after THA. However,
contemporary thromboprophylaxis has
reduced the overall rate of symptom-
atic deep vein thrombosis (DVT) to less
than 5% after THA. Moreover, residual
calf thrombi are more prevalent than
thigh thrombi, and, in contemporary
practice, symptomatic PE occurs in 1%
to 2% of patients, and fatal PE occurs in
0.1% to 0.5% of patients. Major embolic
events in the lung can be fatal within
minutes. Minor emboli may be well tol-
erated from a hemodynamic perspective
and clinically silent but may be the fore-
runners of larger fatal emboli. Similarly,
because administrative inpatient bill-
ing data are increasingly accessible, it is
important to remember that symptom-
atic in-hospital thromboembolic events
(0.53%), particularly DVT (0.26%) and
PE (0.14%), represent less than 15% of
all cases of VTE disease (2% to 5%) that
occur after THA; with contempor-
ary anticoagulation prophylaxis, 85%
of events occur after discharge.

Nevertheless, abrupt cessation of warfarin
in chronically anticoagulated patients
may result in rebound hypercoagula-
bility and a greater risk of early in-hos-
pital PE after total joint arthroplasty.

Perioperative bridging anticoagulation
while not taking warfarin may be con-
sidered in this population. The
sooner the event occurs post-
operatively, the greater the risk of
bleeding. However, unlike with phar-
macoprophylaxis, no compromise ex-
ists to full-intensity anticoagulation
in this patient population. The risk of
recurrent PE with intravenous heparin
in the first 24 hours after the event in
the setting of a subtherapeutic partial
thromboplastin time (PTT; < 2.0%) is
more than twice that of patients with
a therapeutic PTT. Both groups have
a comparable risk of bleeding. During
the entire course of treatment, the risk
of recurrent VTE disease is more than
15 times greater in the subtherapeutic
group. Conversely, full therapeutic an-
ticoagulation in the early postoperative
setting has major complications that
must be considered to determine op-
timal treatment. Initiating therapeutic
anticoagulation with intravenous hepa-in to manage a clinically meaningful
thromboembolic event within the first
5 days of THA is associated with a risk
of serious hemorrhagic complications,
which are severe enough to discon-
inue heparin in 35% of patients. This
has resulted in the recommendation
that bolus dosing should be avoided
when instituting therapeutic heparin
to treat a proximal DVT or clinically
important PE within the first 5 to
7 days postoperatively to avoid bleeding
associated with overshooting the target
PTT range.

Given the serious adverse bleeding
events associated with early periopera-
tive full-intensity anticoagulation,
securing a definitive diagnosis of PE
or symptomatic proximal DVT is es-
tential before instituting therapeutic
anticoagulation. The implementation
of anticoagulation therapy while the
diagnosis is being confirmed should
be discouraged. Rather, the possibility
of an acute PE soon after hip replace-
ment should be investigated urgently
so that a decision can be made about
heparinization using a definitive diag-
nosis. In most instances, this requires a
reliable imaging study of the thrombus.

In contemporary practice, this decision
is rarely based on the results of a ven-
tilation/perfusion scan; multidetector
chest CT is the tool of choice for di-
agnosing PE. Although the images
and increased sensitivity of modern
CT are impressive, a recent study has
raised concerns about overdiagnosing
PE based on the clinical relevance of
subsegmental pulmonary filling defects
identified on multplanar CT that were
previously unrecognized and therefore
untreated. This implies that subseg-
mental filling defects in the absence of
hypoxemia may not require aggressive
treatment. Rather, such findings may
represent embolization of intravasated
material from the medullary canal as a common byproduct of instrumenting the femur and/or tibia during the course of hip and knee arthroplasty. Parvizi et al suggested that a diagnostic, therapeutic trial of 2 L/min of nasal oxygen may help discriminate clinically meaningful events that require active management with full-intensity anticoagulation from those that do not. The correction of hypoxemia within 10 to 15 minutes suggests no need for further evaluation. During the past 25 years, the authors of this chapter have routinely used nasal oxygen at 2 L/min for 48 hours after hip and knee arthroplasty. Despite the advent of multidetector CT for the detection of PE at the institutions of this chapter’s authors, an increase in the diagnosis of PE secondary to the identification of subsegmental defects in the early postoperative period has not been noted.

After in-hospital VTE has been diagnosed, effective management requires balancing the benefits of acute anticoagulation with the risk of bleeding in the early postoperative period after THA. Calf thrombi generally respond to a continued prophylactic anticoagulation regimen of low-intensity warfarin (international normalized ratio, 2.0) extended to 6 weeks’ duration. Typical physical therapy and activity regimens can proceed without interruption.

In contrast, although the management of asymptomatic proximal thrombi and PE can be controversial, symptomatic proximal thrombi and PE require specific anticoagulation therapy. The treatment of PE has been safely initiated as an outpatient procedure, but the authors of this chapter prefer in-hospital anticoagulation of the patient postoperatively to better monitor the elevated risk of bleeding associated with therapeutic anticoagulation in the perioperative period. In contrast to the customary practice with medical patients, parenteral heparin should be initiated as a continuous infusion without administration of a bolus. For this reason alone, the surgeon should remain engaged in managing the anticoagulation of the THA patient in the early postoperative period. Physical therapy is suspended during therapeutic anticoagulation, and this chapter’s authors prefer a compression dressing to minimize the risk of bleeding from the wound. After therapeutic PTT levels have been attained, or 5 days after the commencement of full anticoagulation, whichever takes longer, physical therapy and usual activity are resumed. Traditionally, anticoagulation is converted to warfarin to complete the prescribed course of therapy, which is typically 3 months for proximal DVT and 6 months for PE. Recurrent PE in the face of therapeutic anticoagulation or any absolute contraindication to full anticoagulation are indications for an inferior vena cava filter as a lifesaving measure.

### Summary
Complications are an inevitable potential part of any surgical procedure, including THA. However, with knowledge of the risk factors for the most common complications of THA, the rate of these events may be reduced. If complications do occur postoperatively, a thorough understanding of treatment strategies can optimize patient outcomes.

### References
Adult Reconstruction: Hip


