

Anaesthesia, Venous Thromboembolism and Hip and Knee Joint Replacement

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INTRODUCTION

Soon after Total Hip Replacement (THR) was commenced in 1960,¹ and Total Knee Replacement (TKR) in 1971,² a significant incidence of post-operative venous thromboembolism (VTE) was noted. In clinical trials where venography was mandatory, the prevalence of deep venous thrombosis (DVT) in patients not given chemoprophylaxis was 45%-57% after THR and 40%-84% after TKR. Pulmonary embolism (PE) occurred in 0.7%-30% after THR (fatal in 0.1%-0.4%) and 1.8%-7.0% after TKR (fatal in 0.2%-0.7%).³

In a recent study by one of the authors (RO'R), of 5999 consecutive patients over nearly seven years in the one institution, the prevalence was much lower when short-term chemical and physical thrombo-prophylaxis were used. In this series, DVT was found in 8.6% of patients after THR, in 25.6% after TKR and in 35.0% following bilateral total knee replacement (BTKR). Symptomatic in-hospital non-fatal PE occurred in 1.9% of all patients, and three patients suffered fatal in-hospital PE (0.02%).⁴

ARE POST-THR AND POST-TKR DVTs DANGEROUS?

If DVTs are dangerous, and prophylaxis has been shown to decrease their prevalence, then prophylaxis should be used. If they are not, there is no place for prophylaxis, with its attendant risks.

On one side of this question, Murray in 1996 concluded from meta-analytical studies that there was not enough evidence to decide that any form of chemoprophylaxis decreased the death rate after THR.⁵ He therefore felt that guidelines recommending routine chemoprophylaxis to prevent death after THR were not justified. On the other hand, the recent review of the American College of Chest Physicians recommended anticoagulant prophylaxis after both THR and TKR.⁶

The review commented on the difficulty of finding appropriate end-points in clinical

trials of thromboprophylaxis. If either all-cause mortality or fatal PE is used as the outcome measure, large trials are needed because of the low incidence of death, and autopsy confirmation of PE is difficult. Further, the review pointed out that insistence on mortality or fatal PE as the only important outcomes ignores the significant burden of illness due to symptomatic thromboembolic events.

HOW SHOULD DVTs BE DIAGNOSED? WHO SHOULD BE INVESTIGATED?

Even if one believes, as we do, that DVTs following THR and TKR are important and prophylaxis should be used, one has to decide how to diagnose DVTs in this context. Should all patients be investigated for DVT, or only those who are “symptomatic”?

We think that the concept of “symptomatic” and “asymptomatic” DVTs is flawed. After THR and TKR all patients have some pain and swelling in the leg, and it is clinically impossible to be certain as to whether patients have a DVT or not. In the Mater Trial,⁴ all patients were investigated with venous Doppler ultrasound (DUS) of both legs in order to estimate the prevalence accurately. We found that it was difficult to know who had a DVT without investigation; if a DVT was discovered, it was difficult to predict its behaviour. With treatment, 90% of thromboses showed no extension after a week, but some lengthened and some were associated with PE.

These findings raise a question. Should only those patients clinically suspected of DVT be selectively investigated (on the grounds that most DVTs are relatively harmless and the prevalence of fatal PE is low), or should concern about morbidity arising from DVTs and non-fatal PEs (and the difficulty in knowing which DVTs will cause further problems and which ones will not) prompt investigation of all patients? We feel the latter course is the preferable one, and that all patients should have thromboprophylaxis, pre-discharge DUS and appropriate management of any DVT found.

As a further reason for this protocol, many of our patients had long journeys home after discharge. These sometimes involved many hours of travel by car, train or plane, with some even travelling on international flights. It seemed prudent not only to decrease the incidence of in-hospital DVT in these patients, but also to know their individual pre-discharge DVT status before approving such travel in their relatively immobile state.

WHAT ANAESTHETIC TECHNIQUE IS OPTIMAL FOR THR AND TKR?

1. The Physician's view

In the Mater Hospital study, one of us (RO'R) had assessed many of the 5999 patients well before admission to hospital. If the patients required medical consultation after surgery, they were seen by the same physician. Over the nearly seven years of the study, the impression was formed that different anaesthetic techniques resulted in quite different post-operative well-being, especially in the first 48 to 72 hours.

Those who had general anaesthesia (GA) followed by patient-controlled analgesia (PCA) seemed more drowsy, in more pain and more likely to have GIT problems, especially vomiting, than those having epidural anaesthesia with epidural analgesia via a catheter for 36 hours post-operatively. The latter technique was commonly used in the early years of the study, which began in April 1995. The epidural patients seemed more alert, in less pain and were more able to cooperate with the physiotherapist in the

first two or three post-operative days. This cooperation is especially important after TKR, when being able to put the new knee through as wide a range of movement, at the earliest possible time, seems advantageous to outcome. Obviously long-term studies, rather than clinical impressions, are needed to see if this really is the case. The epidural patients seemed able to eat and drink earlier than the GA patients, and were less likely to vomit.

In summary, THR and TKR patients need careful initial selection by their general practitioner and orthopaedic surgeon. If they have a chronic medical condition, or if there is any doubt about their fitness for surgery, they should have a thorough assessment by a physician, well before their admission to hospital. Ideally, that same physician should be readily available to discuss with the anaesthetist the optimal intra- and postoperative care, and to carry out any medical post-operative care.

2. The anaesthetist's view

The relief of postoperative pain remains a considerable challenge to every surgeon and anaesthetist. There are many reasons for adequate relief of postoperative pain other than the obvious comfort to the patient. There is now good evidence that inadequate postoperative pain relief can lead to chronic pain syndromes persisting well beyond the surgical experience. Pain relief has now been elevated to the status of a "Human Right" and public expectation in this area is high.⁷ Many techniques are available to relieve a patient's pain. Over the past forty years, these have included inhalational techniques, intramuscular and subcutaneous opioids, nonsteroidal analgesics, intravenous opioids administered intermittently, continuously or by patient controlled methods and the more invasive methods of peripheral and neuraxial blockade. New concepts have emerged and a better understanding of the physiology and pharmacology of neural transmission and receptors has allowed a more rational approach to the problem.

As noted earlier, O'Reilly et al found a high prevalence of venous thrombosis and potential embolism in lower limb joint replacement in spite of modern physical and pharmacological prophylaxis. These results pose considerable questions about clinical management. Joint replacements, especially of the knee, are extremely painful procedures. However, in decisions on the management of this pain, the overriding factor is the question of safety. Whichever anaesthetic and analgesic method is selected, it must offer the patient the highest level of safety possible. No method is without potential complications, but some techniques are less invasive and carry less likelihood of permanent sequelae.

As already discussed, we believe that THR and TKR patients need chemo-prophylaxis against VTE. Anticoagulation poses a dilemma with regard to neuraxial blockade and, on the basis of the "Mater Study", we now know that a number of patients will develop DVTs and will require large doses of anticoagulants during their hospital stay and after discharge. The recently conducted Master Trial found no decreased morbidity and mortality with the use of epidural anaesthesia.⁸ This trial was confined to major abdominal surgery and there was no reference to the question of anticoagulation. However, the authors commented that pain relief with EDB was probably superior to other methods and that the ability to cough painlessly was a large advantage. There is also the beneficial effect of the ablation of the neurohumoral stress response to surgery, and the widely held belief that neuraxial anaesthesia offers protection against venous thrombosis.

The incidence of epidural haematoma is very low, although it may be under-reported. It can occur spontaneously, unrelated to surgery or anaesthesia. The development can be insidious, late in onset and difficult to diagnose. When it occurs, epidural haematoma may be catastrophic, and even when early diagnosis is made with modern imaging techniques, the outcome can vary from residual neurological deficit to frank quadriplegia. Evidence suggests a higher risk with thoracic epidurals, especially in elderly females.

A high incidence of epidural haematoma in the USA was attributed to excessive dosage of prophylactic anticoagulants, but following modification of the dose, cases still appear.⁹ Based on large clinical studies there are conventional rules regarding the concomitant use of epidurals, especially with indwelling catheters, and anticoagulants.¹⁰ Rules define so-called safe insertion and removal times, which seem to be crucial issues. A testing problem arises when a patient with an indwelling epidural catheter is diagnosed with a DVT or other vascular incident requiring high dose LMW heparin or warfarin.

A complicating factor with these rules is the unpredictability of the duration of low molecular heparins and the inability to reverse them adequately. Warfarin is also particularly dangerous and to rely on a "near normal" INR is fraught with danger. In spite of clinical and laboratory estimations, we are still "flying blind" to a considerable degree with regard to epidural vascular fragility and potential coagulopathy.

The use of single shot spinal block with a fine pencil tip needle certainly appears attractive in view of the above discussion. Complications can still occur, but are less likely. Spinal morphine with proper postoperative supervision may be a safe alternative to an epidural. Dosage is important with regard to the development of sudden late onset respiratory failure. Many anaesthetists are also turning to peripheral nerve blocks with long acting local anaesthetics as an alternative. Like any other technique, complications such as direct neural damage and local anaesthetic toxicity can occur. Although usually quite satisfactory, PCA analgesia can be associated with serious respiratory depression, especially if over-enthusiastic opioid loading occurs intraoperatively or in the recovery room.

In summary, the anaesthetist must offer the patient a safe method of pain relief, even if acknowledging complete analgesia may not be achieved. All patients must be fully informed of all aspects and risks of the method selected. We can be a little reassured that most postoperative pain is quickly forgotten. The best technique is probably the one the anaesthetist is most familiar with. The training of dedicated nursing staff is also very important. The choice must come from a careful evaluation of all aspects of the available methods in the light of the care and observation available in each institution.

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