Multimodal protocols for pain control, blood loss management and thromboprophylaxis have been shown to benefit patients by being more effective and as safe (fewer iatrogenic complications) as conventional protocols.

Proper patient selection and education, multimodal protocols and a well-defined clinical pathway are all key for successful day-case arthroplasty.

By potentially being more effective, cheaper than and as safe as inpatient arthroplasty, day-case arthroplasty might be beneficial for patients and healthcare systems.

Keywords: day case surgery; hip arthroplasty; knee arthroplasty

Introduction

The demand for total hip arthroplasty (THA) and total knee arthroplasty (TKA) is predicted to increase as a consequence of the increased prevalence of osteoarthritis, mainly resulting from longer life expectancy, the epidemic of obesity and changes in lifestyle.\(^1\) It has been shown that higher morbidity and mortality is associated with prolonged hospital stay after total joint arthroplasty (TJA).\(^2\) This current situation generates multiple issues for healthcare systems, principally an unsustainable high cost.\(^3\)

In order to reduce the cost for society and improve the safety of TJA, there have been many efforts over the last decade to reduce the length of stay (LOS) after surgery. Therefore, protocols named either ‘fast-track’ or ‘enhanced recovery’ were introduced and found to be successful\(^4\) compared with conventional pathways. While this led to a reduction in the LOS to around one to three days,\(^4\) day-case or outpatient arthroplasty, defined as patient discharge on the same day after surgery,\(^5\) is still relatively uncommon worldwide.

Day-case TJA may be worth considering, provided that it is shown to be beneficial for patients and healthcare systems as a safe, effective and cost-effective technique. This instructional review aims at answering this questioning by defining the safety and effectiveness of day-case arthroplasty.

Evidence supporting day-case arthroplasty

Both patients and healthcare systems appear to benefit from day-case joint replacement as it is substantially less expensive (around 30%) for healthcare systems\(^3\) and with similar, if not better, safety (complications rate) and effectiveness (patient satisfaction and functionality) compared with conventional pathways for TKA,\(^6-16\) unicompart mental knee arthroplasty (UKA)\(^12,14,17-20\) or THA.\(^3,10,12,13,15,21-26\) Table 1 summarizes the published readmission and complication rates associated with day-case arthroplasty. The literature at present (Table 1) reflects a Grade B practice recommendation\(^27\) for day-case arthroplasty; based on the limited best available evidence, therefore, there is still a need for further high-quality randomized controlled trials.

Patient eligibility

A number of comorbidities such as diabetes, malnutrition, coagulopathy, high blood pressure, cardiovascular and pulmonary disease, and corticosteroid usage may make patients ineligible as there may be an increased risk of post-operative complications and consequently longer LOS.\(^19,28-30\) A scoring system to identify patients suitable for day-case arthroplasty has recently been published.\(^28\)
The proportion of eligible patients scheduled for TJA who undergo day-case surgery seems to vary substantially between private and public hospitals (90% vs 24% of patients, respectively).19,20,31

**Patient education**

Before surgery, it is important to ensure patients have adequate support in place at home and that someone is available to help them after surgery.32 Patient education before surgery has been shown to decrease LOS in TKA33 and is especially important in certain groups, for example, patients with anxiety.34

**Anaesthesia**

The choice between general anaesthesia (GA) or regional anaesthesia (RA) for day-case arthroplasty is controversial35 and both may be acceptable. While an apparent shorter LOS and lower morbidity and mortality were initially shown with the use of GA compared with RA,36 more recent research suggested the opposite.37 Regarding oral intake, it is recommended that patients do not have clear liquids at least 2 hours before surgery and avoid solid food for 6 hours before surgery.38 Therefore, post-operatively, early oral nutrition and hydration should be provided.
**Analgesia**

One pre-requisite to promote day-case surgery is to achieve pain control with few side-effects. This has been shown to be best achieved with a multimodal pain control protocol. The administration of medication is usually started before surgery with drugs such as paracetamol, cyclooxygenase-2 inhibitors and gabapentinoids, followed during surgery with local infiltration analgesia (LIA) containing a long-acting local anaesthetic and post-operatively with a combination of oral medication. Compared with RA, LIA has fewer potential complications such as nerve damage, autonomic blockade, spinal haematoma formation and infection and also preserves motor function for early mobilization, but it may have more of a role to play in day-case TKA than THA. The effectiveness of post-operative wound catheters is unclear but there may be an increased risk of infection with their use. Corticosteroids can also be used anytime pre-, intra- and post-operatively as an anaesthetic and anti-emetic and have proven effectiveness and safety with no increased risk of surgical site infection.

**Venous thromboembolism (VTE) prophylaxis**

Preventing post-operative VTE without significantly increasing the risk of bleeding is best accomplished with a multimodal patient-specific approach using non-pharmacological (hydration, early mobilization, calf compression with stockings or an intermittent pneumatic compression device (IPCD)) and pharmacological means of prophylaxis (such as aspirin or anticoagulant drug). The choice of which combination to use is based on VTE and bleeding risks, aiming to limit the use of anticoagulants (low molecular weight heparin (LMWH) or warfarin). In low-risk patients that have no previous history of VTE, the use of pharmacological or mechanical thromboprophyaxis with an IPCD appears to be acceptable. There is still no consensus on the optimum drug for thromboprophyaxis and both the American Academy of Orthopaedic Surgeons and the American College of Chest Physicians support the use of either aspirin or LMWH or warfarin (with an international normalized ratio (INR) of < 2.0) for low-risk patients. However, a recent large multicentre study concluded that there was no difference in VTE occurrence using aspirin or LMWH in TKA and THA. Novel oral anticoagulants such as rivaroxaban appear to be superior to aspirin and LMWH in preventing VTE, but are associated with an increased risk of wound complications and major bleeding. In high-risk patients, such as those who have had VTE in the past, the combination of chemical and mechanical prophylaxis is recommended.

**Blood loss management**

Post-operative anaemia is a common complication in day-case and inpatient TJA (Table 1) and also requires a multimodal approach for effective management. There is no evidence to suggest the optimal timing of haemoglobin (Hb) checks after day-case arthroplasty or whether it is necessary at all. In non-day-case arthroplasty, it appears that the maximum Hb decrease is seen after 4 days. Pre-operatively, blood loss with day-case TJA can be minimized with patient selection (e.g. patients with a Hb > 13 g/dL) or patient optimization by, for example, giving erythropoietin to anaemic patients pre-operatively. Intra-operatively, tranexamic acid has proven to be effective and safe for haemostasis in TJA and is now considered as a game-changer for blood loss management. The effects of tourniquet use are unclear at present, with earlier systematic reviews and meta-analyses suggesting no reduction in total blood loss, while a more recent systematic review and meta-analysis suggested the opposite. Suction drainage does not appear to offer any benefits in TKA or THA and actually appears to increase the need for transfusion post-operatively. Controlled hypotension may be another way to achieve haemostasis during surgery.

**Surgical technique**

While most day-case TJA publications used minimally invasive muscle-sparing approaches, successful day-case TJA may also be achievable with conventional approaches. Alternative minimally invasive muscle-sparing approaches for TKA and THA have been shown to speed up recovery time and would probably help with successful day-case TJA. Similarly, kinematic alignment of knee implants may have more of a role to play in day-case arthroplasty as it appears to lead to faster recovery. However, long-term outcomes need to be studied before mainstream use of the kinematic alignment technique.

Preventing wound ooze is important when sending patients home on the day of surgery, and although very little definitive evidence exists regarding different methods of closure and their effects on LOS and ooze, it would seem that the combined use of subcuticular sutures with tissue adhesives is a good way to help prevent wound ooze and reduce LOS.

**Rehabilitation**

Early post-operative patient nutrition and mobilization are key for effective rehabilitation and in facilitating discharge. Physiotherapy appears to be more important for TKA than THA and can be achieved with equal effectiveness by patients in their own home with telephone follow-up instead of on the ward. Other key factors in early mobilization are good pain control, avoiding the use of surgical drains and preventing postural hypotension after surgery with crystalloid volume expansion.
Patient discharge criteria

There does not appear to be widespread agreement in the literature on day-case arthroplasty as to which criteria have to be fulfilled before a patient can be safely discharged. Some authors discharge patients as long as they have normal vital signs, adequate pain control and safe mobilization. However, others also take into account blood loss and only discharge patients with < 500 mL intra-operative blood loss or with a Hb of > 9.7 g/dL. Further work is needed on developing and establishing the most reliable criteria for safe discharge after day-case TJA.

Day-case arthroplasty protocols

Proper patient selection, education and a well-defined clinical pathway are keys for successful day-case TJA. The majority of publications on successful day-case TJA selected patients aged no older than 65 to 80 years, with a maximum body mass index (BMI) of 35 to 40 kg/m², and no significant comorbidities such as diabetes, cardiopulmonary disease or previous VTE. Most authors reported using a minimally invasive approach, tranexamic acid, RA or GA, multimodal opioid-sparing analgesia and aspirin for VTE prophylaxis. There appears to be widespread variation in the literature on the choice of closure materials, the use of suction drains and urinary catheters. Based on the available literature, some of the possible key features of safe and effective day-case arthroplasty are summarized in Table 2.

Conclusion

By potentially being more effective, cheaper than and as safe as inpatient arthroplasty, day-case arthroplasty may be beneficial for some patients and healthcare systems. Proper patient selection and education, multimodal-based protocols and a well-defined clinical pathway are key to successful day-case TJA. Multimodal-based protocols for pain control, blood loss management and thromboprophylaxis have been shown to benefit patients by being as effective as but safer than conventional protocols. In order to guarantee its safety and effectiveness, there is still a need for further prospective studies on the long-term outcomes after day-case arthroplasty as well as clinical trials to demonstrate the clinical relevance compared with current standards.

Table 2. Example clinical pathway and criteria to select patients suitable for day-case arthroplasty

| Patient suitability criteria | Pre-operatively | Intra-operatively | Post-operatively |
|-----------------------------|-----------------|-------------------|-----------------|
| • American Society of Anaesthesiologists class 2 or below | • Patient education | • Regional or general anaesthesia | • Immediate mobilization, nutrition and hydration |
| • No mobility aids | • Pre-medication with paracetamol, a gabapentinoid, a cyclooxygenase-2 inhibitor, a corticosteroid, an anti-embolic and opioid | • Minimally invasive approach | • Self-directed physiotherapy at home for total knee replacement (if suitable) |
| • Good social support | | • Tranexamic acid | • Crystalloid rehydration if volume depletion |
| • Haemoglobin of > 13 g/dL | | • Local infiltration analgesia | • Aspirin for low-risk, novel oral anticoagulant + mechanical thromboprophylaxis for high-risk patients |
| • No previous VTE | | • Controlled hypotension | • Discharge home if < 500 mL blood loss |
| • No cardiopulmonary disease or diabetes | | | • Haemoglobin check 0-4 days post-operatively |
| • No long-term steroid usage | | | |
| • BMI < 40 | | | |
| • No cognitive impairment | | | |

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