Postoperative numbness of the knee following total knee arthroplasty

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ABSTRACT

INTRODUCTION The infrapatellar branch of the saphenous nerve is often injured during total knee arthroplasty (TKA), leading to numbness in its distribution distal to the incision. This is illustrated in a patient who suffered full-thickness burns to the lateral aspect of the knee from a hot water bottle. However, the proportion of patients who are informed of this phenomenon (as well as the effect of informing the patient of numbness) has not previously been studied according to the authors' knowledge. The aim of this study was to establish the proportion of patients with whom postoperative numbness was discussed during the consent procedure and whether this discussion was documented.

METHODS A total of 73 patients (103 TKAs) agreed to take part in this study between 16 May and 9 July 2011. Patients were asked about their recollection of numbness being mentioned prior to the procedure as well as whether they experienced postoperative numbness. Statistical analysis was performed using SPSS®.

RESULTS Subjective numbness was noted in 27% of the patients in this study. The prevalence of numbness decreased with time. Patients whose consent process included a discussion of numbness were 3.3 times more likely to report numbness after TKA ($p=0.003$).

CONCLUSIONS Patient education regarding postoperative numbness increases the patient's awareness of any insensate skin that may develop. Numbness after TKA does improve with time but does not resolve completely. It is therefore recommended by the authors that numbness is discussed preoperatively with the patient and that this discussion is documented.

KEYWORDS

Consent – Total knee arthroplasty – Numbness – Neurovascular injury

Accepted 16 July 2013

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A 58-year-old woman was treated with a left total knee arthroplasty (TKA) for osteoarthritis of the knee. She was seen three months after her operation by a physiotherapist as she complained of morning stiffness and she was advised to apply heat to the knee using a hot water bottle for analgesia. On one occasion, she fell asleep with the hot water bottle on her operated knee. On waking, she realised that her skin had discoloured significantly despite feeling no pain.

The patient was reviewed subsequently in clinic, displaying a patch of blackened skin on the anterolateral aspect of the knee joint. This was removed in clinic, revealing a deep sloughy ulcer. Six months of conservative treatment were required. She did not develop any supervening infection, stiffness or loss of function.

The patient was unaware of the likelihood of developing numbness of the skin overlying the knee joint following TKA and that this had occurred. This study was therefore designed to investigate whether patients are informed of the risk of developing postoperative numbness following TKA during clinic consultations and when taking patient consent.

Background

TKA is the end stage treatment for osteoarthritis of the knee.¹ A total of 84,653 primary TKAs were recorded in England and Wales in 2011, a 3.3% increase on 2010.² The mid-line and medial parapatellar approaches to the knee joint are commonly used for TKA. Both approaches usually injure the infrapatellar branch of the saphenous nerve at the distal aspect of the incision and objective numbness of the skin lateral to the knee following a TKA therefore occurs in up to 100% of patients.^{3–5} Subjective reporting of numbness has a lower reported prevalence of between 37%³ and 55%.⁶ These studies did not investigate whether 'numbness' was mentioned in the consent procedure, and to the authors' knowledge no studies concentrating on a correlation between the consent procedure and subjective numbness has been published.

'Informed consent' is the process by which the surgeon explains the procedure in a manner in which the patient can understand and then seeks the patient's permission to perform the procedure. The procedure, expected outcome, re-

Table 1 Patient demographics according to length of time since total knee arthroplasty (TKA)					
Time since TKA	Number of patients	Percentage male	Percentage female	Mean age (range)	Left : right
≤1 year	13	23.1%	76.9%	74.9 years (67.9–90.2 years)	3:10
2–3 years	15	26.7%	73.3%	71.3 years (56.6–86.4 years)	7:8
3–6 years	35	40.0%	60.0%	71.5 years (57.0–81.8 years)	21:14
>6 years	30	43.3%	56.7%	69.2 years (44.1–82.1 years)	13:17

Figure 1 Percentage of case notes and consent forms with documented discussion of neurovascular damage (NVD) and numbness

covery programme, and the known early and late complications of the procedure (for example nerve injury, infection, stiffness and deep vein thrombosis) should be explained in order to gain informed valid consent.^{7,8} Although there is no set law in England and Wales to define ‘informed consent’, guidance is based on case law such as *Chester v Afshar*, in which the House of Lords concluded that it is the duty of a doctor to inform a patient of all inherent risks of surgery.⁹ It is essential to counsel patients about the benefits and risks of surgery prior to any procedure as the consent form serves only as a record of the consenting procedure.

The aim of this study was to establish the proportion of patients who self-reported numbness overlying the lateral aspect of the knee, and whether a relationship between self-reported numbness and documentation of numbness during the consent procedure was present.

Methods

Patients who had undergone a primary TKA and attended the North Manchester General Hospital orthopaedic outpatient clinic for follow-up appointments between May and July 2011 were invited to take part in the study. Each patient signed a consent form prior to participation and they were asked whether they experienced pain or numbness. Pain was quantified using a visual analogue scale (VAS) ranging from zero (no pain) to ten (excruciating pain). Similarly,

numbness or altered sensation across the knee was measured using a VAS score of between zero (no effect) and ten (severely affected). Patients were also asked whether they recalled the doctor mentioning numbness as a possible complication prior to TKA.

Case notes were reviewed at the time of consultation. Correspondence and clinic letters were assessed to find evidence of a discussion of benefits and risks of TKA with the patient, including ‘neurovascular damage’ and skin ‘numbness’, and for any subsequent complications. The preoperative assessment, operation note and anaesthetic record were assessed to collect information regarding the patient’s preoperative health, body mass index, medication history, anaesthetic used, and the tourniquet time and pressure. A database was created using Excel® (Microsoft, Redmond, WA, US) to collate data and SPSS® version 19 (IBM, New York, US) was used to analyse collected data.

Results

A total of 73 patients with 103 TKAs were assessed in clinic. Patients with bilateral knee replacements had each knee included as separate events. Of the 103 TKAs evaluated, 10 were excluded as case notes detailing postoperative care were unavailable. The remaining 93 TKAs (44 left, 49 right) underwent full case note analysis.

The mean patient age at the time of surgery was 71.2 years (range: 44.1–90.2 years) (Table 1). Fifty-nine of the TKAs (63.5%) were performed on female patients. Eighty-three TKAs (89.3%) were performed for osteoarthritis while the other ten (10.7%) were performed for rheumatoid arthritis. Patients were divided into groups depending on the period of time that had passed since their TKA (Table 1). The mean follow-up duration was 59.6 months (range: 1.9–179.7 months). The mean pain score was 1.27 (range 0–8). The tourniquet time was recorded in 76 cases (81.7%) with a mean time of 78.0 minutes (range: 14.0–128.0 minutes).

Numbness

Twenty-five patients (26.9%) reported sensory disturbance of the lateral aspect of the knee, with one further patient describing sensory loss in a stocking type distribution not thought to be secondary to TKA. Two-thirds (68%) of the patients reporting numbness had no medical co-morbidities. The mean age of the patients reporting numbness was 70.6 years (range: 54.4–86.4 years) with a mean follow-up duration of 43 months (range: 2–125 months). Subjective numbness was more apparent in patients within three years of

Table 2 Summary of consent for neurovascular damage and numbness				
Consent form			Clinical record	
	Neurovascular damage	Numbness of the skin	Neurovascular damage	Numbness of the skin
Yes	51 (58.0%)	7 (8.0%)	15 (17.0%)	4 (4.5%)
No	37 (42.0%)	81 (92.0%)	73 (83.0%)	84 (95.5%)

Table 3 Analysis of numbness as a recorded risk in the consent procedure with subjective numbness					
Numbness mentioned in clinical record x Numbness cross-tabulation					
			Numbness		Total
			No	Yes	
Numbness mentioned in clinical record	No	Count	60	17	77
		Within Numbness mentioned in clinical record	77.9%	22.1%	100.0%
		Within Numbness	95.2%	68.0%	87.5%
	Yes	Count	3	8	11
		Within Numbness mentioned in clinical record	27.3%	72.7%	100.0%
		Within Numbness	4.8%	32.0%	12.5%
Total		Count	63	25	88
		Within Numbness mentioned in clinical record	71.6%	28.4%	100.0%
		Within Numbness	100.0%	100.0%	100.0%
Test statistics (McNemar's test)			Numbness and Numbness mentioned in clinical record		
Numbness and Numbness mentioned in clinical record			Numbness	Numbness mentioned in clinical record	
<i>n</i>	88				
<i>p</i> -value (2-tailed)	0.003 (binomial distribution)				
				No	Yes
			No	60	3
			Yes	17	8

surgery (Table 1). Tourniquet time did not affect the prevalence of subjective numbness; 4 of 14 patients (28.6%) with a tourniquet time of less than 60 minutes reported numbness compared with 8 of 23 patients (34.8%) with a tourniquet time of over 90 minutes.

Consent

Consent forms and clinical letters were available for 88 TKAs. Thirty-seven consent forms (42.0%) failed to mention the possibility of neurovascular damage or numbness following the procedure (Table 2). Only 14.8% of both clinical notes and consent form documented the risk of neurovascular injury (Fig 1). Twelve patients (13.6%) could recall numbness being mentioned during the consent procedure but only three of these had this documented in the case notes.

Numbness of the lateral knee was documented in either the clinical record or consent form for 11 patients (Table 2). Of these patients, eight (72.7%) reported numbness. In contrast, of the remaining 77 who had no mention of numbness in their consent form or clinical record, 17 patients (22.1%) experienced numbness. We therefore found that patients with a documented discussion including postop-

erative numbness were more likely to self-report numbness ($p=0.003$). A summary of the results is shown in Table 3.

Patients who had surgery more than 6 years previously ($n=30$) were less likely to have a documented discussion mentioning numbness (1 patient, 3.3%) or neurovascular damage (11 patients, 36.7%) than patients who had surgery within the last 3 years ($n=28$), with numbness documented for 8 patients (28.6%) and neurovascular damage for 21 patients (75.0%).

Discussion

Neurovascular injury is an accepted complication and is discussed commonly during the consent procedure. Bhutta *et al* reported that 56.9% of 400 consultants surveyed warned of neurovascular damage as a complication of TKA during the consent process.¹⁰ We found that patients are usually informed of the risk of developing neurovascular injury during the consent process and this was documented in either the consent form or clinic notes in 67 of 88 patients (76.1%) in this study.

Neurological structures are either motor, sensory or have both functions. Cheung *et al* found that the risk of

developing neurovascular injury, defined as a new onset motor nerve palsy following TKA, occurs in 0.9–1.3% of patients.¹¹ Although uncommon, patients should be informed of this risk prior to the procedure. However, 86–100% of patients exhibit objective numbness of the lateral aspect of the knee following TKA due to injury to the infrapatellar branch of the saphenous nerve, which is a purely sensory nerve.^{5–5} The authors therefore recommend that the definition of neurovascular injury should be differentiated into sensory, motor and vascular injury for the purpose of obtaining consent for TKA.

Numbness of the lateral knee joint after TKA is a significant issue as 25 patients (26.9%) in our study demonstrated subjective numbness on the lateral aspect of the knee following TKA. Only 11 patients (11.8%) showed documentation on the consent form to state that developing numbness after TKA was a risk. Interestingly, 8 of these 11 patients were aware that this had occurred, which was a significantly higher proportion than for patients without this risk being documented.

This result reinforces our view that numbness should be documented as a separate risk to neurovascular injury. The patient in our above case report was unaware of the risk of developing numbness postoperatively, contributing to her suffering a burn injury. Patient education is an important part of the consent procedure. By highlighting the likelihood of developing numbness of the lateral aspect of the knee, medical professionals can help prevent injuries such as that sustained in our case report.

Patients who had surgery more than six years previously were much less likely to have numbness or motor injury documented on either their consent form or case notes. This has improved, possibly because of the increasing awareness of clinicians of these complications (increasing availability of information to the patient) and increasing litigation. The consent procedure is judged to be more informative and thorough by fellow professionals and the legal profession when a detailed account is documented.¹² The authors suggest that a clearly documented discussion stating both the likelihood of developing numbness and the risk of suffering neurovascular injury should be present on the consent form, clinic letters and case notes. Although complications may be discussed during the consent procedure, documentation is essential as it is otherwise difficult for a clinician to prove this discussion took place in the event of litigation.

The authors are aware that this study has some limitations. The patients and case notes were assessed for a total of 103 TKAs but this covered a wide time span (between 2 months and 15 years). Furthermore, patients were assessed for subjective numbness only. Assessing for objective numbness may have demonstrated the need for improved patient education as we would expect a higher proportion of patients to demonstrate numbness.

Further work in this area could focus on researching the effect of patient education during the consent process. The authors suggest that a prospective study is undertaken to increase our understanding of the amount of information patients retain during and after the consent process. Such a

study could assess the effect of using standardised consent forms versus traditional free-hand consent forms or it could assess the use of different media (eg a DVD).

There is also recent interest in the use of femoral or saphenous nerve blockade for postoperative analgesia. These have both demonstrated reduction in analgesic use following surgery. Femoral nerve blockade has a low risk of complications including short-term quadriceps dysfunction, femoral neuritis and residual numbness.^{13,14} Saphenous nerve blockade has to date only been assessed in patients treated by arthroscopic partial menisectomy¹⁵ but is being studied currently to assess its suitability for patients undergoing TKA (ClinicalTrials.gov identifier NCT01333943). Further studies could therefore assess patients for objective and subjective sensory changes after the use of saphenous and femoral nerve blocks in comparison with those treated without nerve blocks for postoperative analgesia.

Conclusions

Patient education of the benefits and risks of performing TKA is essential, and informing them of numbness of the lateral area of the knee following TKA increases patient awareness of this side effect. Sensory and motor injury should be discussed as separate risks during the consent procedure, and patients should be reminded of this insensate area of skin after TKA by both surgeons and physical therapists, especially as this is not a transient phenomenon. Caution should be employed when using extremes of heat on the knee following TKA in order to prevent soft tissue injuries.

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