

## Case Report

## Post-operative cognitive dysfunction after knee arthroplasty: a diagnostic dilemma

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Post-operative cognitive dysfunction (POCD) is common in the elderly, and significantly impacts their recovery. We present an unusual diagnostic challenge where a 65-year-old male presented 4-week post-total knee arthroplasty with acute cognitive dysfunction lasting 19 days. Curiously, there were no findings uncovering a specific cause, but during investigation underlying predisposing factors such as depression, mild memory deficits and generalized brain volume loss were identified. The impression after psychogeriatric review was that of an organic brain syndrome with overlay of depression, with a complex presentation as POCD. After escalation of behavioural disturbance, he was commenced on anti-psychotic/depressant, with immediate response. We emphasize the importance of pre-operative evaluation of cognitive function and risk factors in all geriatric patients undergoing elective surgery, and the need for further characterization of POCD, as well as experimental research elucidating the underlying mechanisms to better identify and treat this important post-surgical phenomenon.

### INTRODUCTION

Post-operative cognitive disorders, such as delirium and post-operative cognitive dysfunction (POCD), are common in the elderly ( $\geq 65$  years), and can lead to increased hospital stay, morbidity and long-term cognitive decline [1]. It is often associated with cardiac surgery, but increasing evidence suggests a particularly high incidence with elective orthopaedic surgery [2, 3]. This is concerning given that with an increasing elderly population, hip and knee arthroplasties are becoming more commonplace.

Here, we present a diagnostic dilemma of a patient with a delayed complex presentation of POCD post-knee arthroplasty.

### CASE REPORT

A 65-year-old Caucasian male presented to a district hospital with acute confusion and agitation overnight. He had a left total knee arthroplasty 4 weeks ago, complicated by a haematoma and prosthesis infection with *Propionibacterium*

*acnes*. However, he was stable, mobilizing independently and was receiving i.v. amoxicillin (6 week course) as an out-patient. There was no previous delirium. Both patient and his wife denied significant cognitive decline or baseline behavioural issues, although they reported 3–5 years of decreased short-term memory resulting in forgetting/misplacing objects. There was no previous diagnosis of depression; however, he was receiving relationship counselling for marital conflict. Past medical history included atrial fibrillation, hypertension and hypercholesterolaemia, and previous right total knee arthroplasty, aortic valve replacement and parathyroidectomy (all uncomplicated). He was not on any analgesia, anti-depressants or anti-psychotics. Alcohol intake was three units a week, with no recreational drug use. He worked as a handyman, with no infectious or toxic exposures.

He was afebrile, and clinical examination including the knee was unremarkable. He was alert and orientated to place, person and situation but occasionally not to time. There was a blunted affect with depressed mood, with partial insight into memory loss and mood issues. Of note was tangential speech, disordered thought stream and perseveration. This was

accompanied by bizarre behaviour such as bathing fully clothed, and acute agitation and disorientation. Interestingly, he could recall some of these events, and was frustrated by his lack of control. He denied hallucinations, and reported good sleep with no nightmares. Mini-mental state examination was 26/30 (main loss in short-term recall), and frontal assessment battery 14/18. All laboratory investigations were normal, including white cell count ( $5.67 \times 10^9/l$ ), C-reactive protein (7.0 mg/l), renal and liver function and other routine biochemistry. Delirium screen was negative (thyroid function, vitamin B12/folate, vitamin D, syphilis serology, urine microscopy/culture). Blood glucose remained stable during admission (random sampling 5–6 mmol/l). CT-head was also unremarkable.

He was transferred to a tertiary hospital for further assessment of neurodegenerative disease. During admission, there was no change in infectious parameters. Autoimmune screen (ANA, ANCA, ENA, Anti-dsDNA), and hepatitis B, C and HIV serology were all negative. MRI brain showed generalized volume loss out of proportion with age, with mild chronic small vessel ischaemia. Positron emission tomography showed no focal areas of hypometabolism. An echocardiogram to exclude infective endocarditis was negative. Two weeks later there was escalation in behavioural disturbance with aggression towards hospital staff, and he was empirically commenced on regular risperidone (0.5 mg) and citalopram (10 mg), with good response within a day and discharge 5 days later. The time from the onset of symptoms to resolution was 19 days. Post-discharge review at 10 days noted marked improvement in mood, with no further behavioural disturbance.

## DISCUSSION

A major challenge in the diagnosis of this case was that apart from the initial post-operative complication, the patient had otherwise been recently well, with no significant investigative findings. Admittedly, this would be easy to classify as delirium which we know to be multi-factorial, and in many aspects this case fulfils the Diagnostic and Statistical Manual of Mental Disorders, 4th edition (DSM-IV) [4], International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD-10) [5] and confusion assessment method (CAM) criteria for delirium [6]. The acute presentation, predisposing factors of possible mild underlying cognitive disorder (memory issues, depression, decreased brain volume) and cardiovascular risk factors, with likely precipitating factors (recent surgery including general anaesthesia and infection) all contribute to this diagnosis. However, this was also contradicted by several important points. This includes the delayed presentation (4 weeks post-operatively), prolonged course (over 2 weeks), lack of conclusive findings despite thorough investigation including no evidence of uncontrolled infection or ongoing systemic inflammation and finally the immediate response to anti-psychotic/depressant treatment. Evaluating this constellation of factors, psychogeriatric review

formed the impression of an organic brain syndrome with some overlay due to depression, with a complex presentation as POCD rather than delirium. The acute change in cognitive trajectory was deemed likely to be secondary to recent events (surgery and infection). We use the term POCD loosely in the sense that there are no formal diagnostic criteria available, but this can be a diagnosis of exclusion where the cognitive disturbance does not appropriately fulfil the criteria for delirium, dementia or amnesic disorder [4, 7, 8]. Neuropsychology assessment forms an important component in the diagnosis of POCD, and ideally should be performed both pre- and post-operatively to conclusively characterize POCD. However, the logistics of organizing this may not always be possible, and the patient may not co-operate with this testing. Both applied in this case. Nevertheless, this is warranted during follow-up review.

Although no formal treatment guidelines exist for POCD, as with delirium and dementia the practical management of POCD relies on an individualized multi-component approach with close monitoring. This begins with addressing precipitating and potentiating factors such as infection, pain, medications and electrolyte imbalance, as well as optimisation of the patient environment. For refractory cases, pharmacological intervention may proceed cautiously with neuroleptics. The anti-psychotic haloperidol is most commonly used. However, atypical anti-psychotics are considered first-line in the elderly due to their better tolerability profile and decreased rate of extra-pyramidal side effects, with risperidone being most studied in the elderly population [9]. With follow-up, 3 months is the most characterized time-point in the literature, and follows the ISPOCD study which remains to date the largest and most comprehensive trial to study POCD [10]. Additionally, long-term POCD will need evaluation at 1-year post-operatively.

This case provides a reminder of an important clinical lesson that the post-operative recovery of elderly patients can be significantly influenced by cognitive decline. It highlights the need for pre-operative evaluation of cognitive function and risk factors in all geriatric patients undergoing elective surgery, allowing screening of at-risk patients and optimization where possible and to facilitate early diagnosis and treatment. POCD is often a diagnostic dilemma, and there is a critical need for better characterization and definition of POCD, including well-designed studies systematically examining cases of POCD and their long-term sequelae in relation to different surgical procedures. Furthermore, another major issue is the paucity of research elucidating the underlying mechanisms of POCD. Many hypotheses exist, including the interaction of systemic inflammation, pain, hypoxia and general anaesthesia [8]. Specifically in the case of arthroplasties, intra-operative cerebral embolization may contribute to POCD [3]. These avenues need to be more fully interrogated in order to improve our understanding, and thus identification and treatment of this important post-surgical phenomenon.

Written informed consent was obtained from the patient and next-of-kin (spouse) for publication of this case report, and a copy of this documentation has been submitted to the journal.

### AUTHORS' CONTRIBUTIONS

K.K.Y. and P.J. conceptualized and designed the manuscript. K.K.Y. collected data and wrote the initial draft, and subsequently both authors reviewed and gave final approval of the manuscript.

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