COMMENTARY

Cognitive dysfunction after surgery and anaesthesia: what can we tell the grandparents?

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Abstract

‘Grandpa was never the same after his operation!’. This statement describes a myriad of possible clinical difficulties that can afflict older people after hospitalisation for major surgery. We summarise the evidence pertaining to the phenomenon of Postoperative Cognitive Dysfunction, a condition defined as an abnormality on neuropsychological testing, which is said to afflict up to 14% of over 70 years olds undergoing elective surgery. So far none of the expected surgical, anaesthetic and environmental risk factors have been convincingly demonstrated to be responsible for this observed deterioration. While recognising the high incidence of the condition as a neuropsychological entity we accept that it is difficult to translate this into a reliable estimate of clinical risk for the individual patient.

Keywords: anaesthesia, cognitive, dysfunction, surgery

A 75-year-old retired lecturer is intellectually well preserved and still undertakes part-time editorial work. He has a moderate level of physical disability due to osteoarthritis and requires regular analgesia but has no other significant medical problems. He is weighing up the pros and cons of elective total hip replacement. He wants a precise estimate of his chances of sustaining a significant persistent cognitive impairment, and tells you that his decision whether or not to have surgery will hinge on that estimate. He is willing to accept a degree of transient postoperative delirium, provided the cognitive effects are not long-lasting. What should you tell him?

The above case history is fictitious, but the dilemma it poses is not uncommon. If the patient were facing surgery for a life-threatening condition such as a resectable colonic cancer, a small risk of long-term cognitive impairment would almost certainly be acceptable. However, much of the elective surgery carried out in old age is to improve quality of life under conditions that are not in themselves life-threatening, and here even a small risk of mild cognitive impairment might deter some patients. As the first study of patients who had ‘never been the same’ since their operation was published in 1955 [1] and as the findings of several well-designed studies have been published in the last decade, our patient might reasonably expect a precise answer to his question about the long-term cognitive risks of surgery and anaesthesia. However, much uncertainty remains.

While brief cognitive screening tests are in wide clinical use in older people, they are not designed to detect subtle peri-operative cognitive changes that might correlate with the subjective opinions of patients and their carers [2]. Clearly any attempt to provide our patient with precise information needs to use data from more comprehensive neuropsychological testing. The approach used by Rasmussen and fellow collaborators from the International Study of Postoperative Cognitive Dysfunction (ISPOCD) is a serious attempt to provide robust clinical data about postoperative cognitive risk [2, 3]. Indeed, in selecting a particular ‘battery’ of neuropsychological tests and defining ‘abnormality’ the researchers have effectively monopolised the definition of Postoperative Cognitive Dysfunction (POCD). The ISPOCD battery includes four established neuropsychological tests, which are usually administered alongside measures of depression, Activities of Daily Living and a subjective assessment of cognitive change [2–4]. The battery is applied to control groups of non-operated volunteers as well as to surgical patients to adjust for variability and learning effects, and changes between preoperative and postoperative cognitive scores (the latter classically at 1 week and 3 months after surgery) are expressed in terms of Z scores [2]. Such analyses allow minor changes in several tests or marked changes in a few tests to be highlighted to give a final ‘diagnosis’—the presence or absence of POCD.
word interference and (iv) letter–digit Coding. Changes in test performance of controls between baseline and follow-up are used to compensate for learning effects.

All studies use prospective pre- and postoperative testing. The ISPOCD test battery consists of tests of (i) visual verbal learning, (ii) concept shifting, (iii) stroop colour word interference and (iv) letter–digit Coding. Changes in test performance of controls between baseline and follow-up are used to compensate for learning effects and to normalise data from the study subjects [2,3]. Standardised ($Z$) scores for study subjects are constructed for individual tests, and for a composite of all tests. POCD is defined when two $Z$ scores in individual tests or the combined $Z$ score changes by $>1.96$ [2,3]. In addition to the test battery, most studies also include measures of depression, self-assessed cognitive function and activities of daily living. In the studies listed, all patients underwent major non-cardiac surgery, except for those in [8] where minor surgery was performed. Postoperative cognitive testing was carried out at 1 week and 3 months in all studies, but Abildstrom et al. [5] also followed a subset of the ISPOCD1 patients for 1 to 2 years. Exclusions for all the studies are as given in ISPOCD1 [4], but include a Mini-Mental State Test of 23 or less, a number of neurological and other medical conditions, and certain medications.
Six key studies using the ISPOCD approach are summarised in Table 1 [4–9]. These include the initial ‘ISPOCD1’ study [4] of patients aged 60–79 undergoing major non-cardiac surgery, a subsequent 1–2 year follow-up of a subset of the ISPOCD1 subjects [5] and two ‘ISPOCD2’ studies in the over-60s (comparing the effects of general vs. regional anaesthesia after major surgery [7], and the cognitive sequelae of minor surgery [8], respectively). Additionally, an important recent study by Monk et al. [9] has compared young (18–39), middle-aged (40–59) and old patients (60+) undergoing major surgery, adding to data from a previous ISPOCD2 study on the age group 40–60 [6].

If we accept the ISPOCD definitions of POCD, the above studies allow us to make three broad statements. First, POCD 1 week after surgery is common at any age following major non-cardiac surgery carried out under general anaesthesia. While Table 1 shows that the incidence in the over-60s was 19.7–41.4% as compared with 3–5% in controls [4, 7, 9], similar incidences were reported in the 40–60 age group [6, 9], and even in those aged 18–39 [9].

Secondly, unlike the situation for POCD at 1 week, the incidence of POCD at 3 months after major surgery appears to have a definite relationship with age. In the under-60s, the incidence of POCD 3 months after surgery was no different from that of non-operated controls (∼5%) [6, 9]. However, in the over-60s, rates of POCD at 3 months were 9.9–14.3% [4, 7, 9], which were significantly higher than the 1.8–2.8% rates found in controls. Of particular relevance to our 75-year-old patient was the finding that the group aged 70 and over had twice the rate of POCD of the age group 60–69 (14% vs. 7%) [4].

Thirdly, information about POCD beyond 3 months is limited. Using a Danish and British subset of ISPOCD1, Abildstrom et al. [5] reported that 10.4% of the over-60s had POCD 1–2 years after surgery. While this incidence was the same as that found in controls (10.6%), only 47 of the latter were available, so confidence intervals were wide.

The above statements come with caveats, however. Using the current ISPOCD criteria, POCD is a binary (yes or no) diagnosis. The extent of the disability and distress caused by POCD has not yet been assessed in detail, although Price et al. [10] have recently explored the different implications of simple memory impairment and/or executive dysfunction. In addition, some of the individuals who report subjective cognitive impairment (severe enough in one case to lead to early retirement [11]) do not always meet the objective criteria for POCD, raising questions about specificity and sensitivity on the one hand, or alternative explanations such as subtle depression on the other. While we can tell our retired lecturer about the likely overall incidence of POCD in his age group, we cannot tell him with any precision whether he will find it more difficult to do his editorial work or to complete his daily crossword puzzle.

So what should our patient be told? We would suggest that the information contained in the above three statements is placed before him, together with the caveats, and that he is invited to weigh up what appears to be a small risk of POCD at 3 months against the current effect on his quality of life of his hip symptoms. The likelihood of his hip symptoms deteriorating to a level where he is eventually forced into having surgery, perhaps in an older frailer state, also needs to be taken into consideration, as does the effect of strong analgesia on his current cognitive functioning.

We hope that this brief commentary will stimulate comments and suggestions, and we also plan to use our hypothetical case as a discussion point within the Age Anaesthesia Association. While further research might lead to more definitive advice in the future, an interim consensus about the current state of knowledge would be highly desirable at the present time. In regard to future studies, we note that few patients aged 80 and over have been included in past studies, and that existing study designs have tended to exclude patients with clear preoperative cognitive impairment (MMSE <24), even though clinical experience and theoretical considerations suggest that rates of persisting POCD are likely to be higher in those with a poor initial ‘cognitive reserve’ [12].

Key points

- Cognitive dysfunction after major non-cardiac surgery is common.
- Advanced age is a major risk factor for long-term dysfunction.

Conflicts of interest

None.

References

4. Moller JT, Cluitmans P, Rasmussen LS et al. for the ISPOCD investigat...


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