

Resuming motor vehicle driving following orthopaedic surgery or limb trauma

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Summary

Following elective orthopaedic surgery or the treatment of a fracture, patients are temporarily unable to drive. This loss of independence may have serious social and economic consequences for the patient. It is therefore essential to know when it is safe to permit such patients to return to driving. This article, based upon a review of the current literature, proposes recommendations of the time period after which patients may safely return to driving. Practical decisions are made based upon the type of surgical intervention or fracture. Swiss legislation is equally approached so as to better define the decision.

Key words: *automobile driving; reaction time; postoperative complications/rehabilitation; hip arthroplasty; knee arthroplasty; arthroscopy; anterior cruciate ligament; fracture fixation; hallux valgus; spinal fusion*

Introduction

“Okay doc, but when can I start driving again?” This common question during our consultation is often difficult to answer. Regardless of whether surgery follows an acute limb injury or is an elective operation, its impact on the ability to drive is often one of the patient’s major concerns. What is the best answer for our patients? How much information is relevant? This review article is concerned with highlighting current concepts based on contemporary literature, and relies on current legislation to provide better and safer recommendations for our patients.

The “orthopaedic” ability to drive has multiple requirements

It is with much finesse that medical objectives and patient expectations must be addressed within a given legal framework. From the surgeon’s viewpoint driving must not result in complications at the operation site or to the traumatised limb. This medical aspect of driving seems to be the easiest to appreciate since it is directly concerned with the patient’s

follow-up and may be documented by clinical examination and serial X-rays. However, a radiologically healed fracture doesn’t necessarily permit the patient to drive. The ability to drive a motor vehicle is described in quite general terms in the Swiss Road Traffic Act: “The driver will constantly be in command of his vehicle in such a way that allows him to conform to his duty to remain cautious at all times” [1]. This text may be reformulated regarding the driver’s obligations as follows:

1. The patient must have shown a satisfactory postoperative or post-traumatic functional recovery.
2. He must not be limited in his ability to drive by pain from the operative site nor pain-alleviating medication.
3. He must be in control of his vehicle at all times. This includes having both hands on the steering wheel with adequate grip, adequate strength to activate the brake pedal, and an optimal reaction time.

The total time to break (TTB) is an important factor in security; it can be measured in the experimental setting with precision, is objective and reproducible. The TTB is the sum of the reaction time of the driver, the time to move the foot from one pedal to the other, following through the course of the pedal, and finally applying sufficient pressure to brake. The maximal TTB reference value varies between countries from 700 milliseconds to 1,500 milliseconds. Even though there is no legal reference in Switzerland for TTB, most driving schools agree upon 1,000 milliseconds as an average. It is crucial not to forget that this value is directly responsible for stopping distances! At 50 km/h, adding 500 milliseconds to the TTB will result in a stopping distance that is lengthened by 7 meters.

From the legal standpoint, the first annex of the Swiss Ordinance regulating the admission of people into road circulation defines minimal medical requirements for driving a motor vehicle [2]. Regarding the orthopaedic aspect of this decree, a driver must not display any “deformity that may considerably impede on breathing and mobility” nor have any “serious mutilations, stiffness or palsies that are impossible to correct sufficiently with special devices”. In

addition, according to the law on road traffic “any physician can notify the competent authority that delivers and withdraws licenses of a patient unable to safely drive a motor vehicle...” [3]. The physician is therefore not obliged to report an unfit patient, but he is automatically not bound to medical professional secrecy in case he chooses to notify the authorities. Recently there was the situation of an 82-year-old man with diabetes and vision problems who accidentally ran over a young female bicyclist who died as a consequence of her injuries. The Swiss Federal Supreme Court deemed that the doctors (in this case the general practitioner and the ophthalmologist) had no obligation to report their patient’s unfitness to drive a vehicle [4]. Despite this, current jurisprudence stipulates that physicians have the obligation to inform their patients of their medical unfitness to drive a motor vehicle (whether because of disease or medication) and must place this information in the patient’s medical record [5]. The patient should be informed that he or she might be considered at fault in a motor vehicle accident. In such an instance, they may be subject to civil and/or criminal action, and the insurance company may decline any financial claims. The consequences may be dramatic if the accident has caused severe injuries to other people.

What does the literature say?

Articles in the literature addressing the issue of driving ability after an orthopaedic intervention or limb trauma are scarce. With the exception of a few that will be mentioned, most studies have been conducted on driving simulators comparing patients before and after the surgical procedure with use of a control group in some cases as a comparison. The model used is always a car with automatic transmission, two pedals (accelerator and brake), and a steering wheel. There are no currently available studies using a stick-shift transmission model. Additionally, there are no data available with regards to motorcycle or bicycle driving abilities after limb trauma and/or surgery.

The following section presents the different results on driving competency following common orthopaedic surgical procedures or limb trauma.

Total hip arthroplasty (THA)

Two authors have studied TTB after THA [6, 7] in patients operated on the right and left side compared with a control group. Ganz et al. showed a return to preoperative TTB values for right-sided THAs at 4 to 6 weeks postoperative. This finding was corroborated by McDonald et al. who tested their patients 8 weeks after surgery. Depending upon different authors a reasonable approach is to resume driving 6 weeks after THA of the right hip. Regarding a left-sided THA, the two studies show that surgery doesn’t significantly affect TTB when driving an automatic transmission type vehicle in which all tasks are performed with the right lower limb. In this situation it has been suggested that driving may be resumed 1 week after surgery if permitted by the driver’s postoperative pain.

Total knee arthroplasty (TKA)

Studies addressing the issue of total knee arthroplasty (TKA) were conducted in a similar fashion to those for THA, but demonstrated greater variability in their results. Spalding et al. found a return to preoperative TTB values 8 weeks after surgery for the right knee [8]. On the left side no significant differences were noted between preoperative and postoperative TTB. The authors therefore suggest that driving may be resumed 8 weeks after a right knee replacement, and as soon as pain subsides following left knee surgery. Surprisingly, Pierson et al. found that the side operated upon did not influence TTB [9]. While the preoperative TTB was poor in arthritic patients, the results did not seem to significantly worsen immediately after knee replacement. It has even been reported that TTB was significantly superior to preoperative values by 12.5% at 6 weeks post surgery. The author therefore permits driving at 6 weeks postoperatively for all TKAs. Marques et al. found that TTB was poorer 10 days after surgery, but returned to preoperative values after right knee surgery at 30 days postoperative [10, 11]. On the left knee no significant difference was noted before and after TKA. The decision to resume driving could therefore be considered at 1 month after surgery on the right knee and as soon as pain allows on the left.

Based on these studies, a reasonable compromise is to recommend our patients to resume driving at 6 weeks after total knee replacement, regardless of which side was operated upon.

Knee arthroscopy (KA)

We found only one study concerning TTB following knee arthroscopy [12] in which 30 operated patients were compared to a control group of 25 healthy subjects. Only arthroscopies of the right knee were considered and included diagnostic arthroscopy, partial meniscectomy and chondroplasty. TTB was significantly longer than controls at 7 days postoperative and generally returned to preoperative values at 4 weeks. However, 30% of these patients still showed sub-optimal TTB times 1 month after a right knee arthroscopy. The authors therefore recommend a minimum of 4 weeks without driving after a “simple” arthroscopy, meaning without postoperative limitation of joint motion or restriction of weight bearing such as in cases of meniscal suture, for example. No data is currently available concerning left knee arthroscopy. If the patient drives an automatic car, it seems reasonable that driving may be resumed 4 weeks postoperatively for the right knee and as soon as pain permits on the left.

Anterior cruciate ligament (ACL) reconstruction

Two authors have studied the effect of anterior cruciate ligament (ACL) reconstruction on TTB. Gotlin et al. reported on 14 patients with patellar tendon ACL reconstruction [13], and Nguyen reported on 73 patients with hamstring ACL reconstruction, 36 on the right knee and 37 on the left [14]. Concerning the right knee in both studies, TTB times were the same as controls after 6 weeks and were considered within the legal range for the countries in which they took place (USA and Australia, respectively). The amount of intra-articular fluid or residual pain did not seem

to affect TTB. Driving in patients following ACL reconstruction may therefore be resumed 6 weeks after surgery. For surgery on the left knee driving may be resumed in an automatic transmission vehicle as soon as pain subsides.

Casts and splints

Several studies have evaluated the effect of various methods of upper and lower extremity immobilisation (casts and splints) on driving ability. Contrary to previous studies, in this article most observations have been made on healthy subjects in real driving situations. The results agree that upper limb immobilisation, regardless of the type (splint, cast, etc.), side involved (right/left), and whether the elbow or thumb is or is not immobilised, significantly reduces driving performance [15–18].

The current recommendation is not to drive as long as an upper extremity immobilisation device must be worn. With the use of an anonymous questionnaire, Kalamaras et al. questioned patients about their behaviour with respect to driving while immobilised. They found that 50% of patients drove with their cast and 22% did so on a daily basis, even though 42% of patients thought it was illegal. This reinforces the importance of talking about driving issues with patients, and stresses the need to inform them about the risks involved for themselves as well as for other drivers.

Regardless of the type of lower limb immobilisation devices tested (removable knee or ankle splints, casts with or without a deambulating sole, etc) all were found to prejudice driving security and TTB, whether tested in simulated [19, 20] or real driving situations [21]. The only exception concerns immobilisation of the left lower extremity which does not impede driving capability in an automatic transmission vehicle [21]. With the exception in the latter situation, it is therefore recommended not to drive as long as lower limb immobilisation is necessary.

Complex lower limb trauma

A wide variety of fractures and surgical procedures may occur in lower limb traumatised patients which makes the analysis of every single case impossible. However, a general rule may be proposed from observation of these fractures. A well-designed study compared TTB in a simulated driving test in two distinct groups and compared them to controls [22]. The first group included 22 patients who sustained a diaphyseal fracture of the right femur (n = 9) or right tibia (n = 13) treated by intramedullary nailing followed by non-weight bearing for 6 weeks. The second group included 35 patients who sustained an intra-articular fracture of the right lower extremity (acetabular, n = 7; tibial condyle, n = 12; tibial pilon, n = 4; and calcaneus, n = 12) treated by open reduction internal fixation (ORIF) and followed by a non-weight bearing period of 12 weeks. In both groups, whether the fracture was intra- or extra-articular, the TTB decreased to normal values compared to controls 6 weeks after weight bearing was resumed on the affected limb. This corresponded to 12 weeks after surgery for extra-articular fractures and 18 weeks after intra-articular injuries. Thus, it can be recommended to resume driving 6 weeks after full-weight bearing on the right lower limb is achieved. Left lower limb fractures have not been studied. However it seems reasonable to believe that automatic car

users may be able to drive safely once operative pain subsides, as mentioned in the previous cases.

Ankle osteosynthesis

With respect to ankle osteosynthesis the same authors conducted a study similar to that for complex lower limb trauma [23]. A total of 31 patients who underwent open reduction internal fixation (ORIF) of an ankle fracture (single malleolus, bimalleolar and tri-malleolar) were tested following a postoperative period of non-weight bearing for 6 weeks and compared to healthy subjects. After cast removal no differences were found regarding the type of fracture. In the specific case of ORIF of a right ankle fracture driving may be resumed 3 weeks after full-weight bearing is possible. Left ankle fractures were not studied. The current recommendations should therefore be the same as for other injuries of the left lower extremity.

Foot surgery

There are a vast number of procedures in foot surgery, and surgical correction of hallux valgus deformity is probably the most commonly performed world-wide. If we exclude cuneo-metatarsal arthrodesis (Lapidus procedure) for which a non-weight bearing period is usually prescribed, patients are normally allowed to bear weight as tolerated in the postoperative period with a rigid-sole shoe. One study [24] observed mean TTB values in 28 patients who underwent surgery for hallux valgus with a first metatarsal osteotomy (Wedge, Scarf or basal osteotomy type) and compared the results with a control group. At two weeks postoperative, not only was the total time to brake significantly longer in the operated patients than in the controls, but only 25% of operated patients could actually perform the test because of postoperative pain. Thus they would be incapable of performing an emergency stop if needed under real driving conditions. At six weeks after surgery the situation returned to normal. It is therefore recommended not to drive for 6 weeks following a first metatarsal osteotomy for a right-sided hallux valgus deformity.

Various other forefoot procedures (for example, hammer or claw toe correction) logically have the same impact on bony structures as a 1st metatarsal osteotomy, thus making it reasonable to recommend an identical 6 weeks delay before returning behind the wheel. Regarding the left foot, once again no data exists. Our recommendations are thus the same for other left lower limb surgeries.

Lumbar spine surgery

There is currently only one study that has observed the effect of the surgical treatment of lumbar disease on TTB [25]. A total of 21 patients without neurologic sequelae who underwent lumbar spondylodesis at times associated with decompression, were tested preoperatively, and at one week and three months postoperatively. A group of 31 healthy individuals served as controls. All subjects had a TTB within legal limits by Austrian values. Patients consistently had significantly poorer TTB values compared to controls in the preoperative and postoperative period. However, postoperative values were not significantly worse in these patients. A clear correlation was present between the pain experienced by the patient (with use of

an analogue visual scale) and TTB. The latter increased in parallel to the level of pain felt by the patient, with those with the most pain having the slowest braking times. For patients who undergo lumbar spine surgery, the authors recommend resuming driving 1 week after surgery, if post-operative pain is adequately controlled.

Conclusions and advice to patients

Table 1 summarises the current recommendations for several standard situations based upon available studies. There is no data about stick-shift transmission vehicle driving. Indeed, having to use the clutch and manually shift gears is likely to add to the complexity of the task. The repercussions on driving manual transmission cars following an orthopaedic intervention are yet to be studied. Logically, a patient should only be able to resume driving a stick-shift transmission vehicle once he is able to fully depress the clutch pedal without pain. In the case of left lower limb fractures he should have resumed full weight-bearing. To strengthen these recommendations, specific studies regarding this aspect of driving need to be established. In all cases, it is necessary to approach the issue of automobile driving with every patient. He or she must be informed of what they may and may not do, as well as the risks inherent to inappropriate driving for themselves and others. Additionally, from a legal standpoint this information should clearly be documented in the patient's medical record. For complex cases such as professional drivers, it may be useful to seek further advice at the University Institute of Legal Medicine (IUML), or to request legal advice at the Cantonal Office of Motor Vehicles.

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Table 1: Resuming motor vehicle driving: Summary of the recommendations for the most frequent situations, depending on the intervention and the affected side.

	Left side	Right side
Total hip arthroplasty (THA)	1 week (automatic transmission cars); 6 weeks (manual transmission cars)	6 weeks
Total knee arthroplasty (TKA)	1 week (automatic transmission cars); 6 weeks (manual transmission cars)	6 weeks
Simple knee arthroscopy	As pain allows	4 weeks
ACL reconstruction	As pain allows	4 to 6 weeks
Casts and splints (upper and lower limbs)	No driving as long as the device is worn (except for left lower limb devices + automatic transmission car)	
Complex lower limb trauma	6 weeks after weight bearing is resumed (12 weeks for femur/tibia nailing; 18 weeks for articular fractures ORIF)	
Ankle ORIF	9 weeks (3 weeks after weight bearing is resumed)	
HV and forefoot surgery (lapidus procedure excluded)	As pain allows	6 weeks
Lumbar spine surgery (spondylolysis included)	1 week, if pain is adequately controlled, without neurologic deficit	

ACL = anterior cruciate ligament. ORIF = open reduction internal fixation. HV = hallux valgus.

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