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Clinical Study

The timed up and go test for lumbar degenerative disc disease

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ABSTRACT

We report on the use and performance of an objective measure of functional impairment, the timed up and go (TUG) test, in clinical practice for patients with lumbar degenerative disc disease (DDD). We illustrate nine representative patients with lumbar DDD, who were selected from an ongoing prospective study, to report our clinical experience with the TUG test. In addition, a preliminary sample of 30 non-selected consecutive patients is presented. The following parameters were assessed preoperatively, and 3 days and 6 weeks postoperatively: back and leg pain using the visual analogue scale (VAS); functional impairment using the Oswestry disability index (ODI) and Roland–Morris disability index (RMDI); health-related quality of life using the EuroQol 5D (EQ5D) and Short-Form 12 (SF-12). The TUG test results improved by 2.6 and 5.4 s after 3 days and 6 weeks compared to the baseline assessment. The mean VAS for back and leg pain decreased by 2.3 and 5.3, respectively, after 3 days, and by 2.7 and 4.6 after 6 weeks. The mean RMDI and ODI decreased by 3.4 and 23.3, respectively, after 3 days, and by 7.0 and 28.0 after 6 weeks. The mean EQ5D increased by 0.38 after 3 days and 0.358 after 6 weeks. The mean SF-12 mental component scale decreased by 0.2 after 3 days and increased by 5.6 after 6 weeks, whereas the mean SF-12 physical component scale increased by 6.4 after 3 days and by 9.8 after 6 weeks. The TUG test proved to be a useful, easy to use tool that could add a new, objective dimension to the armamentarium of clinical tests for the diagnosis and management of DDD. From our preliminary experience, we conclude that the TUG test accurately reflects a patient's objective functional impairment before and after surgery.

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1. Introduction

The primary goals of spine surgery are to relieve pain, improve function and ameliorate health-related quality of life (HRQOL) [1]. Therefore, an accurate measurement of these parameters is of paramount importance in daily clinical practice. In current practice, several valid and reliable subjective measures are available, including the visual analogue scale (VAS) for back and leg pain intensity, and the Oswestry disability index (ODI) and Roland–Morris disability index (RMDI) scales to assess functional disability [2]. The Short-Form 36 or 12 (SF-36 and SF-12) and EuroQol-5D (EQ5D) are also widely used for HRQOL assessments [3,4]. Despite extensive validation and frequent application in clinical practice, all the above mentioned measures have one major limitation, their subjective nature. However, subjectivity is also a strength of these assessments, as they directly represent the patients' feelings which are ultimately what matter most for patient management. One of the major drawbacks of subjective measurement tools is their low interindividual comparability, as patients have different individual thresholds for pain. Patients rate their pain or functional disability differently, and various educational and cultural backgrounds and motivational aspects factor into this [1]. The same issue applies to HRQOL as patient expectations can differ according to socioeconomic status, knowledge about health and disease, and personal and familial experience [5].

Although Deyo et al. recommended the introduction of uniform standards for measuring patient reported outcomes more than 15 years ago, and despite an increasing demand for quality control, there is still no consensus regarding outcome assessments for spine surgery [6]. Besides radiographic findings (for example, anterio-posterior thecal sac diameter), the only existing objective clinical outcome measures are the range of movement (with a goniometer), muscle strength (with a newton metre), or walking

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speed and distance [1]. Recently, new objective outcome measures have been tested using an advanced tracking technology based on global positioning systems [7], but thus far, none of these measurements have been adopted into daily neurosurgical practice. We recently proposed the introduction of the timed up and go (TUG) test in order to establish a standardized and objective outcome assessment in spine surgery [1]. The TUG test was originally established as an objective measure of function in the elderly population. It is used to assess the risk of falls and ability to live independently, and has also been identified as a predictor of overall survival [8]. The TUG test assesses simple but important functions, including standing up, walking, changing direction, walking again and sitting down. These basic functions are essential for patients to resume their activities of daily living and regain quality of life after spine surgery. Furthermore, the TUG test is quick and easy to perform, as it only requires a chair and 3 m of walking space.

The goal of this study is to illustrate the use and performance of the TUG test in clinical practice. We share some of our preliminary experience with the TUG test in nine selected patients, to demonstrate some of the strengths of the TUG test as an adjunct in clinical patient evaluation. In addition, an unselected sample of 30 consecutive patients included in a prospective observational study is presented, to give a first estimate of the TUG test's ability to detect changes in functional status in accordance with established subjective outcome measures.

2. Materials and methods

The cohort included nine representative patients who were scheduled for lumbar degenerative disc disease (DDD) surgery and were selected from an ongoing prospective study performed at both the University Hospital of Geneva and the Cantonal Hospital St. Gallen in Switzerland. Of these patients, five were men and four women with a mean age of 55.5 years (range: 29–80). Four had lumbar spinal stenosis (LSS), three had lumbar disc herniation (LDH), and two had lumbar DDD with instability that required spinal fusion. In order to demonstrate the usefulness of the TUG test in daily clinical practice, six of the patients were chosen because they responded well to surgery, and the other three because of their unfavorable clinical courses. In addition to the TUG test, all patients were subject to a comprehensive clinical assessment including neurological status, complications, VAS for back and leg pain, functional disability using RMDI and ODI, and HRQOL using SF-12 and EQ5D before surgery, at 3 days and 6 weeks after surgery (Table 1).

2.1. The TUG test

Patients were asked to sit and lean back on an armchair with their arms rested on the armrests. On command of the examiner, the patients had to stand up and walk as fast as possible (without running) to a marked line on the floor at a 3 m distance. Once they reached the line, they turned around 180° and returned to the chair and sat down as quickly as possible, with their time recorded in seconds (Fig. 1). Patients were allowed to wear their regular shoes and use a walking aid, if required.

3. Results

The results of the baseline assessment for the nine patients, as well as the postoperative assessment at day 3 and 6 weeks are depicted in Table 1.

3.1. Responders to surgery

The improvement of leg pain in responders was more pronounced with a mean difference of 6.7 points on the VAS, compared to a mean difference of 4.2 points for back pain intensity (Table 1). The TUG test performance time halved from 11.9 s preoperatively to 5.5 s at the 6 week follow-up, equivalent to a relative improvement of 6.4 s. The mean EQ5D health state score increased by more than 50% on the overall health state scale of 0–100%. Similarly, the mean EQ5D index increased by more than 0.4 index points at the 6 week follow-up. For the SF-12, both the physical and mental component summary scores (PCS and MCS, respectively) improved in the responders, although the mean improvement was more pronounced for the PCS (13.3 PCS *versus* 8.6 MCS). Likewise, the functional status, assessed by the RMDI and ODI surveys, showed an overall improvement postoperatively.

3.1.1. Patient 1

A 31-year old man presented with recurrent low back pain (LBP) and sciatica in the right S1 dermatome, which was refractory to analgesics including morphine, and was without any sensory or motor deficits. The MRI revealed a large right sided paramedian LDH with compression of the S1 nerve root. His TUG test time was 18.8 s at presentation. After a L5/S1 microdiscectomy, the man experienced significant pain relief. His postoperative TUG test times at day 3 and week 6 were 5.9 and 4.7 s, respectively.

3.1.2. Patient 2

A 29-year old woman presented with a 10 month history of sciatica in the left S1 dermatome, with numbness but an absence of motor deficits. She had undergone an L5–S1 microdiscectomy on the left side 3 years earlier. A lumbar MRI showed a large recurrent left sided paramedian L5–S1 LDH. Her TUG test time at presentation was 9.0 s. Due to a failure of extensive non-surgical treatment, a microscopic reoperation was performed. Her postoperative course was uneventful. The TUG test at postoperative day 3 was 7.5 s, and at week 6 it was 6.0 s.

3.1.3. Patient 3

A 65-year-old man presented with a long history of progressive neurogenic claudication with left sided thigh pain, and without any sensorimotor deficits. The MRI depicted osseous LSS at the L3–4 level, along with a left sided paramedian disc bulge. His baseline TUG test was 13.3 s. A selective L3–4 decompression from the left, with undercutting and removal of the subligamentous disc fragment, was performed. He had an uneventful postoperative course, with a TUG test of 15.0 s at day 3, and 5.4 s at 6 weeks postoperatively.

3.1.4. Patient 4

A 70-year-old man presented with progressive bilateral neurogenic claudication with no sensorimotor deficits, necessitating the daily intake of morphine analgesics. He had an initial TUG test of 10.5 s. A lumbar MRI revealed two-level spinal stenosis at L3–4 and L4–5, without signs of instability. We performed a right sided L4 hemilaminectomy without complications, and the postoperative course was uneventful. His TUG test was 6.0 s at day 3 and 4.8 s week 6 postoperatively.

3.1.5. Patient 5

A 52-year-old man, with a previous history of LDH surgery at the L4–5 level 8 years ago, presented with a 2 year history of bilateral L4 and L5 sciatica and mechanical LBP in equal parts. His initial TUG test time was 10.1 s. A lumbar MRI showed severe DDD with a recurrent right sided paramedian L4–5 LDH and Grade 1 spondylolisthesis. His flexion-extension radiographs showed lumbar

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