Since its initial description by Hibbs and Swift in 1929 [1] , lumbar fusions have been widely used to correct structural defects and degeneration of the lumbar spine, a common ailment in the geriatric population [2] [3].

The past 2 decades have seen a considerable increase in the number of lumbar spinal fusion surgeries.

The most diffused surgical techniques for stabilization of the painful degenerated spine and lumbar instability, represented by transpedicular screws and rods instrumentation with or without interbody cages or disk replacements

Objective

The objective of lumbar spine fixation surgery is to stop motion at a painful spine segment, minimizing the pain and allowing the patients to increase their function [4] [5] [6].

Indications

see Lumbar fusion indications.

Types

Lumbar interbody fusion.

Open lumbar pedicle screw technique.

Lumbar percutaneous transpedicular screw technique

Lumbar transfacet screw fixation

Cortical Bone Trajectory for Lumbar Pedicle Screw Placement

Lumbar translaminar screw fixation

Circumferential lumbar spinal fusion

Uniportal Full Endoscopic Lumbar Fusion Surgery

Non instrumented lumbar fusion

Non instrumented lumbar fusion.

Instrumented lumbar fusion

Instrumented lumbar fusion.

Postoperative management

Rehabilitation programmes using cognitive-behavioural intervention (CBT) are recommended. Further, initiating interventions preoperatively seems beneficial, but only limited data exists in the field of spine surgery.

Patients with degenerative disc disease or lumbar spondylolisthesis undergoing LF were randomized to usual care (control group) or preoperative CBT and usual care (CBT group). Primary outcome was change in Oswestry Disability Index (ODI) from baseline to 1-year follow-up. Secondary outcomes were catastrophizing, fear-avoidance belief, work status and back and leg pain.

At 1-year follow-up there was no statistically significant difference between the CBT group and the control group in ODI score (P = 0.082). However, the CBT group had achieved a significant reduction of -15 points (-26;-4) already at 3 months (between group difference P = 0.003) and this reduction was maintained throughout the year. There were no differences between groups at 1-year follow-up with regards to any of the secondary outcomes.

Participating in a preoperative CBT intervention in addition to usual care did not produce better outcomes at 1-year follow-up for patients undergoing LSF. Although the reduction in disability was achieved much faster in the CBT group, resulting in a significant difference between groups already three months after surgery, it did not translate into a faster return to work. This findings support the need for further research into the use of targeted rehabilitation interventions among patients with elevated levels of catastrophizing and fear avoidance beliefs [7)].

Prognosis

Lumbar Spinal Fusion Prognosis.

Complications

Degenerative Lumbar adjacent segment disease

A total of 1395 patients were identified and the overall 30-day complication rate was 11.47%. The complication rates were 9.04% and 14.05% for patients younger than 65 and older than 65, respectively. When stratified by decade cohorts, the complication rates were 9.04% for the <65 cohort, 13.46% for the 65 to 75 cohort, 16.17% for the >75 to 85 cohort, and 4.00% for the ≥85 cohort. Multivariable regression analysis revealed no statistically significant difference between the <65 and ≥65 age cohorts (odds ratio = 1.26; 95% confidence interval: 0.87-2.19). After stratifying into age cohorts, multivariable analyses revealed no difference in odds of postoperative complication occurrence for any age cohort when compared with the referent group (<65 years of age).

Patients older than 65 years of age have significantly higher rates of complications after lumbar fusion when compared to younger patients. However, multivariable analysis revealed that age was not an independent risk factor for complication occurrence after lumbar fusion [8)].

Surgical stabilization of the lumbar spine is an effective treatment for lumbar spondylosis; in particular, for patients with severe chronic low back pain that has been resistant to three or more months of conservative therapy [9].

Failed solid bony fusion, or pseudarthrosis, is a well-known complication of lumbar arthrodesis. Recent advances in radiographic technology, biologics, instrumentation, surgical technique, and understanding of the local biology have all aided in the prevention and treatment of pseudarthrosis.

A systematic literature review was conducted using the MEDLINE and Embase databases in order to search for the current radiographie diagnosis and surgical treatment methods published in the literature (1985 to present). Inclusion criteria included: 1) published in English; 2) level of evidence I-III; 3) diagnosis of degenerative lumbar spine conditions and/or history of lumbar spine fusion surgery; and 4) comparative studies of 2 different surgical techniques or comparative studies of imaging modality versus surgical exploration.

Seven studies met the inclusion criteria for current radiographic imaging used to diagnose lumbar pseudarthrosis.

Plain radiographs and thin-cut CT scans were the most common method for radiographic diagnosis. PET has been shown to be a valid imaging modality for monitoring in vivo active bone formation. Eight studies compared the surgical techniques for managing and preventing failed lumbar fusion. The success rates for the treatment of pseudarthrosis are enhanced with the use of rigid instrumentation.

Spinal fusion rates have improved secondary to advances in biologies, instrumentation, surgical techniques, and understanding of local biology. Treatment of lumbar pseudarthrosis includes a variety of surgical options such as replacing loose instrumentation, use of more potent biologies, and interbody fusion techniques. Prevention and recognition are important tenets in the algorithm for the management of spinal pseudarthrosis [10].

Pearls

A lumbar fusion that includes L1 should not be terminated at L1 or T12.

The taller the disc space the less likely that posteriorly placed interbody grafts are well suited.

A. The disc may not be significantly degenerated to require discectomy

Case series

Patients undergoing fusion surgery at a single centre for LBP with a duration of more than 3 months were included. They were evaluated using the Short Form Health Survey version-2.0 (SF-36v2) and Oswestry Low Back Pain Disability Index (ODI) questionnaire preoperatively and 1 year after the surgical procedure to identify differences between genders and to evaluate correlations between disability and quality of life. Results:

We included 31 female and 30 male patients. The male patients had higher disability scores at the preoperative evaluation, but improved more than females in all domains of disability at the

postoperative evaluation. HRQoL improved similarly in both genders. The ODI score showed a strong or moderate correlation with 6 of the domains of the SF-36 in males, but with only 3 domains in females. Surgery had a positive impact on the mental status of more men than women at risk of depression. Conclusion:

The type of benefit that surgery offers seems to be influenced by gender. While HRQoL improved in both genders, disability decreased significantly more in male patients. Male patients also showed a closer correlation between HRQoL and disability. We conclude that men and women place different importance on specific aspects of their overall quality of life [11].

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