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Artificial Disc Replacement as an Alternative to Lumbar Spinal Function in the Treatment of Chronic Low Back Pain

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Abstract

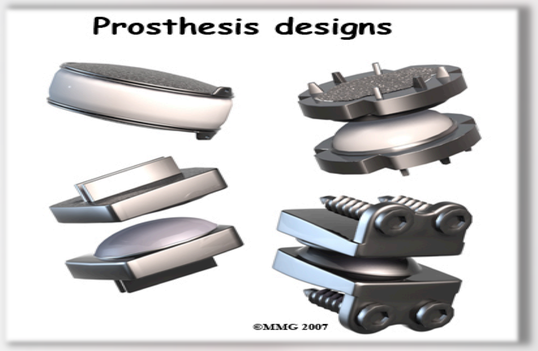
Chronic low back pain leads to activity limitations for the patient and widespread burdens on health care systems. Lumbar fusion has been the "gold standard" surgery for severe chronic low back pain non-responsive to conservative treatment, however it has been associated with continued limitations in spinal mobility. This study was executed in order to compare an alternative surgical intervention, artificial disc replacement, with lumbar spinal fusion in the treatment of chronic low back pain in terms of long term spinal function. Literature searches of trials, guidelines and systematic reviews within the past 5 years were completed exploring surgical procedures, associated long term outcomes, cost analyses, and adverse effects of artificial disc replacement as an alternative to lumbar fusion. Chou et al. (2009) found superiority of artificial disc replacement to lumbar fusion on a composite index of success but no statistical differences in disability decrease ($p<0.0001$). Fritzell et al. (2009) identified potential cost savings with artificial disc replacement but no advantages in terms of overall cost effectiveness (95% CI). Based on these and similar findings, there is not significant evidence to recommend artificial disc replacement over lumbar fusion surgery with regard to long term spinal function. Findings of this study indicate that, while artificial disc replacement may be advantageous in select cases, clinical indications per individual patient remain the deciding factor regarding surgical intervention for chronic low back pain.

Introduction

- Chronic low back pain, the fifth most common reason overall for health care provider visits leads to activity limitations, increased use of health care resources, and financial burdens impacting individuals, families, communities, health care systems, and businesses.
- Treatment options have been limited for those nonresponsive to conservative modalities. Available surgical interventions have been associated with chronic loss of mobility, decrease in functional status, and continued restriction or modifications in activity.
- The purpose of this study was to compare a newer surgical option, artificial lumbar disc replacement, touted as superior in maintaining functional status and mobility, to the traditional "gold standard" surgeries, lumbar spinal fusion procedures, in the surgical treatment of chronic low back pain.

Statement of the Problem

With an increasing prevalence of patients experiencing chronic low back pain and escalating health care costs associated with the treatment of this issue, the need exists for treatments that can maintain mobility, optimal functionality and ideal quality of life.



Research Questions

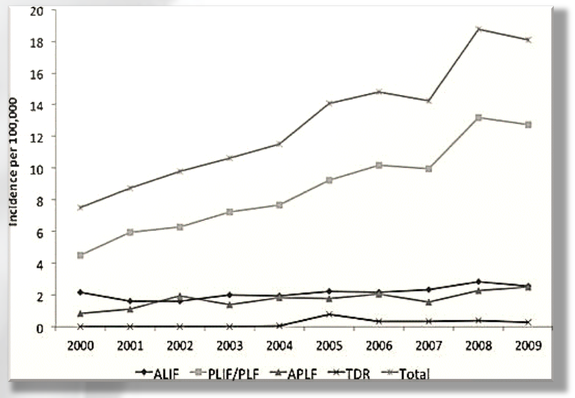
- In patients with chronic low back pain, is there a clinically significant benefit to using artificial disc replacement as an alternative to lumbar spinal fusion in terms of long term spinal function?
- Are artificial disc replacements cost effective as a treatment option for chronic low back pain?

Literature Review

- Berg et al. (2011) determined that the surgical goal of increased mobility was met more frequently with lumbar artificial disc replacement than the surgical goal of stable fusion with lumbar fusion ($p=.01$), however clinical outcome and success of achieving goals was not significantly associated.
- Yoshihara et al.(2015) revealed that artificial disc replacement as a surgical treatment for chronic low back pain did not increase from 2000 to 2009 ($p = .975$) although overall surgical treatment for chronic low back pain increased by 2.4-fold.
- Fras and Auerback (2008) found that in a review of 190 patients (mean age 46.6 years, SD 13.9, range 18-79) in a community spinal surgery practice, only nine patients (14%) showed no contraindications to lumbar artificial disc replacement.
- Siepe et al.(2013) demonstrated satisfactory clinical safety and efficacy with lumbar artificial disc replacement with significant decrease in pain and disability post-operatively ($p <0.001$). Pain relief deteriorated significantly over 48 months ($p<.05$) but remained above baseline.
- Rao and Cao (2013) discovered increased functionality in lumbar artificial disc replacement over lumbar spinal fusion ($p<0.0000001$), decreased pain ($p=0.0006$), and shorter perioperative hospital stays ($p=0.004$). None of these findings however, were determined to be clinically significant.
- Parkinson et al. (2012) revealed lumbar artificial disc replacement to be a less costly procedure compared with lumbar fusion (95%CI), however incremental cost effective ratios revealed no statistical advantage with either artificial disc replacement or lumbar fusion surgery.

Discussion

- Articles reviewed revealed mixed results regarding significant benefits of lumbar artificial disc replacement in regards to long term spinal function in comparison to lumbar spinal fusion surgery.
- While studies revealed statistical benefits in mobility, decreases in complications, and improvements in pain management, no studies were able to show statistically significant superiority of this surgical intervention. This may be due to limited data, study design, and limited time frame available in published literature.
- Despite increases in surgical intervention for chronic low back pain overall, the use of lumbar artificial disc replacement surgery did not show significant increase, possibly due to the small subset of patients that have indications for the procedure.
- Lumbar artificial disc replacement surgery is a less costly procedure from a healthcare perspective, but overall cost advantages cannot be demonstrated.
- Additional high quality studies are needed to confirm statistical benefits of artificial disc replacement surgery.



Trends in the incidence of surgical treatment for lumbar degenerative disc disease from 2000-2009. TDR, total disc replacement; APLF, anterior and posterior lumbar fusion; PLIF, posterior lumbar interbody fusion; PLF, posterolateral lumbar fusion; ALIF, anterior lumbar interbody fusion. Retrieved from Yoshihara et al. (2015)

Applicability to Clinical Practice

- Management of chronic low back pain can be difficult and time consuming for the busy clinician.
- In the discussion of treatment options for the chronic low back pain patient not responding to conservative treatment, lumbar fusion procedures and artificial disc replacement procedures should be identified as treatment options.
- Lumbar artificial disc replacement may be considered for specific individuals who meet criteria, and offer advantages in spinal functioning and mobility.

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