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Increasing age does not affect good outcome after lumbar disc replacement

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Abstract From 1992 to 1998 fifteen Link-Charite SB III disc prostheses were implanted into 14 patients. The main indication was degenerative lumbar disc disease with segmental instability. With a mean follow-up of 48 months (18–68 months); 12 patients had a good (10) or fair (2) outcome regarding pain relief, return to employment and level of general physical activity. In contrast to previous publications we felt that age over 45 years did not appear to adversely affect the outcome.

Résumé De 1992 a 1998 quinze prothèses discales LINK-CHARITE III ont été posées chez quatorze patients avec une dégéneration lombaire. Avec un suivi post-operatoire de 48 mois (18 – 68 mois); douze patients ont bien récupéré en ce qui concerne l'analgesie ainsi que la retour au travail et aux activites physiques générales. Nous ne trouvont pas que l'age plus de 45 ans affectait les resultats.

Introduction

Treatment of degenerative lumbar disc disease remains controversial. Spinal surgeons using total disc replacement (TDR) believe that preservation of function and segmental mobility have advantages over rigid elimination of movement by fusion [1]. Some suggest that restoration of intervertebral height can relieve pressure on pain receptors in the annulus [2] and even produce a "healing effect" on facet joints before irreversible changes occur [3]. There are no controlled trials comparing disc replacement with fusion – commonly seen as the "gold standard" treatment for lumbar instability secondary to degenerative disc disease but clinical results following disc replacement appear promising [1,3,5,7].

Among the different types of TDR prostheses the Link-Charite SB III designed in 1984 is the most commonly used prosthesis with the longest follow-up in Europe. Lemaire in 1997 published the so far most comprehensive and homogenous series – a 4-year follow-up of 105 cases – with 79% excellent clinical results and 87% returning to work [7]. An upper age limit of 45 years has been proposed not only by the manufacturers, but also by several authors [1,5] as increasing age may lead to weakening of the bone structure supporting the prosthesis.

Patients and methods

All patients were preoperatively assessed clinically for pain, neurological symptoms and disability. Conventional radiographs and magnetic resonance imaging (MRI) scans were obtained to evaluate adjacent discs and to exclude spinal canal stenosis or significant nerve root compression. Discography was performed to identify the relevant level by provoking memory pain. We used bone densitometry to assess the bone mass and quality in postmenopausal women.

As part of the informed consent patients were not only prepared for possible complications but also told that long-term results of TDR are not known yet and a second procedure, e.g. removal of prosthesis and/or fusion might become necessary.

Fifteen TDR prostheses were implanted into 14 patients aged 31–61 years (mean 48 years). Nine prostheses were implanted at level L4/L5, four at L3/L4 and two at L5/S1.The group of patients was homogenous regarding their preoperative symptoms. All suffered long-standing disabling lumbar pain and showed clinical/radiological signs of degenerative lumbar disc disease at one level (two patients had two degenerative discs). Two patients had previous surgery (posterior fusion L5/S1- one patient; L4 hemilaminectomy- one patient) and all had undergone several treatment courses by physiotherapists or chiropractitioners. None of the patients were able to carry out their usual professional, domestic or leisure activities without pain.

Postoperatively, patients were allowed to get up on day two and left hospital between day 5 and day 14 to continue their outpatient rehabilitation supervised by physiotherapists.

After an average of 48 months (18–68 months) the patients, 8 men and 6 women were reviewed clinically. Four patients were unable to attend the last follow-up clinic; they were assessed via telephone interview and had their latest X-rays evaluated. Depend-

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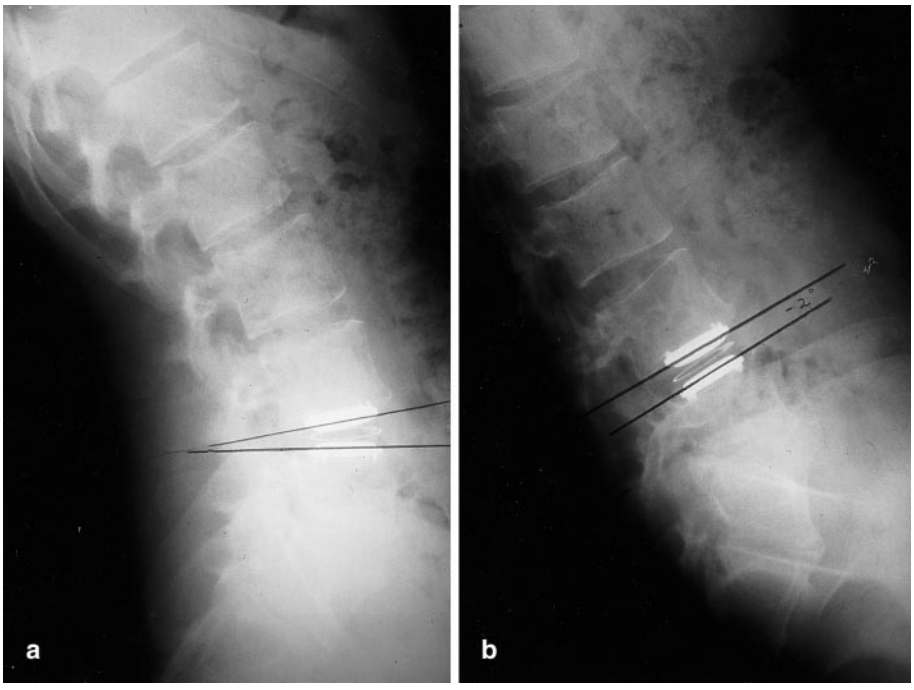

Fig. 1a,b A 39-year-old female, 14 months post L4/L5 TDR. Functional X-rays show a range of 10 degrees between **a** extension and **b** flexion

Table 1 Criteria for clinical results after lumbar surgery according to Stauffer and Coventry [9]

	Pain relief (%)	Return to work	Physical restriction	Use of analgesics
Good	76–100	Yes	No or slight	No
Fair	26–75	Yes, with limitations	Yes, limited activities	Frequent (mild)
Poor	<25	No, disabled	Yes, greatly limited	Regular (strong)

Table 2 Patient outcome related to age

Age	Outcome		
	Good	Fair	Poor
<45 years (*n*=7)	5	1	1
>45 years (*n*=7)	5	1	1

ing on the use of analgesia, physiotherapy and functional restrictions patients were attributed a good, fair or poor result based on the original classification by Stauffer and Coventry (Table 1) [9]. In addition the Oswestry Disability Scoring (ODI) system was employed to demonstrate improved function in activities of daily living [4].

Results

Ten patients had a good result, two a fair and two a poor result. Twelve patients returned to work (5 sedentary workers, 3 heavy physical workers and 4 housewives); 10 patients after an average of 4 months (1–72 months) without functional restrictions and 2 patients after retraining to less physically demanding occupations after 12 months. Seven of the 10 patients with good results had taken no time off work preoperatively and returned to their jobs within 2 months of surgery. Seven of our 14 patients were over 45 years old at the time of surgery; there was no difference in outcome (Table 2).

The radiological results were analysed from AP and lateral flexion/extension views. Prosthetic placement was mostly central, in two cases a slight lateral position did not correlate with any clinical symptoms. Disc height was restored in all cases. The observed maximal range of motion between extension and flexion was 10 degrees (Fig. 1).

Complications

There were no major complications. At follow-up 5 patients had a warmer left foot due to interference with the left paravertebral sympathetic nerves. As patients had been warned during informed consent this did not amount to any complaints.

Vascular anatomy did not allow a planned second level TDR in one patient, who after initial improvement required further surgery (fusion) for symptoms related to the non-operated level, his outcome was therefore unsatisfactory. We had one case of implant migration: an unexpected complication since the lady had normal bone density studies preoperatively. The X-ray taken 6 months after surgery demonstrated that the lower prosthetic endplate had sunk by 3 mm into the inferior vertebral endplate (L4), no deterioration had occurred at

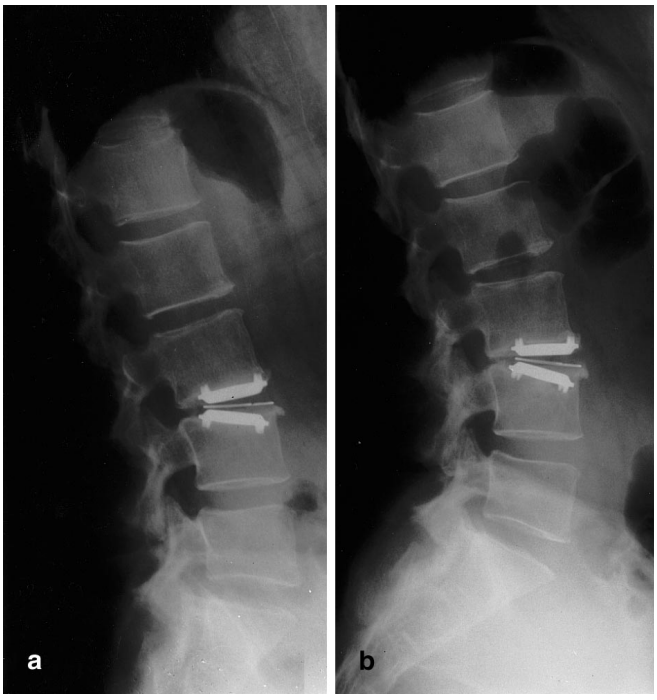

Fig. 2a,b A 52-year-old female, prosthetic migration at **a** 6 months, stable condition and **b** good outcome at 30 months

her last visit (30 months) and her clinical outcome was good (Fig. 2)

Discussion

The TDR prosthesis Charite SB III has been used to treat over 1500 cases of degenerative lumbar disc disease and low grade spondylolisthesis over the past 12 years in Europe. It essentially replaces the "nucleus pulposus" while providing segmental stability. Appropriate sizing of the prosthesis can restore the optimal distance between vertebral bodies and facet joints leading to widening of the intervertebral foramina.

Lumbar arthrodesis (fusion) assisted by bone graft and/or instrumentation is a widely practiced method to treat segmental instability, but has many potential complications [8,11]: pseudo-arthrosis rates of up to 44% [10], significant co-morbidity related to both instrumentation and graft donor site, the need for additional external support and prolonged costly rehabilitation. Accelerated degeneration of adjacent motion segments after fusion – particularly multilevel procedures is causing concern amongst clinicians [6]. Several publications have now shown short rehabilitation times, few complications and a satisfactory rate of patients returning to work after lumbar disc replacement raising its profile as a valuable treatment alternative to fusion [1,3,5,7].

The need for randomised controlled studies between fusion and disc replacement is obvious. Our study shows in accordance with previous publications that TDR can be successfully used to treat back pain and disability resulting from degenerative disc disease. On the basis of our clinical experience we would like to argue the following points.

Surgical outcome is to a large extent influenced by patient selection; so called "yellow flag" points in the patients psychosocial history determine surgical success as much as the correct diagnosis [8]. Twelve of our 14 patients improved their functional level considerably and went on to an active life with minimal disability. Most patients in this particular group were motivated individuals from a stable psychosocial background who in addition had taken no or very little time off work preoperatively. One patient who is being treated for long-standing clinical depression remains unemployed and disabled by her backache, her outcome was poor. Another patient who was involved in litigation to claim disability benefits – an accident at work aggravated his pre-existent back condition still suffers intermittent low back pain 4 years following his disc replacement. His outcome was rated "fair" as he returned to work after retraining and manages with occasional painkillers only.

We would disagree with the proposed age limit of 45 years. The average age of our group (48 years) was higher than in previous publications without affecting the outcome. Arthritis of adjacent joints and poor bone quality invariably affects surgical outcome after any joint replacement. It is therefore important to assess the quality of the bone by densitometry preoperatively particularly in postmenopausal women. However, this may not always be reliable, as normal preoperative densitometry studies in our series did not prevent prosthetic migration in one lady who remains well and asymptomatic. Advanced age should be no contra-indication to lumbar disc replacement as long as facet joint pathology and osteoporosis can been excluded.

Earlier trials have shown that prosthesis migration into vertebral endplates can be a problem even in the younger patient. Despite structural changes to the currently used prosthetic model critics rightfully point out that a further increase in endplate size would mean stronger support of the implant by cortical bone [1].

Lumbar disc replacement can lead to good functional outcome and re-integration into an active, professional life in well-selected patients with lumbar degenerative disc disease even beyond 45 years of age after a relatively short period of rehabilitation.

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