



Remote Cauda Equina Syndrome Due to Overgrowth of Epidural Free Fat Graft: Case Report

Abolfazl Rahimizadeh*, Ava Rahimizadeh, Valiollah Hassani and Shaghayegh Rahimizadeh

Abstract

Lumbar discectomy is being done in increasing frequency worldwide where formation of epidural scar formation has been known as a common cause of its failure. Application of a free fat graft despite controversies has been widely used to prevent further adhesion and post-laminectomy scarring. Single nerve root compression and cauda equina syndrome due to compressive effect of free fat graft with a few days to weeks after laminectomy is well known early complication of lumbar discectomy. However, late neurological deficit as the result of significant increase of fat graft volume has been not addressed previously in the literature.

Herein, the authors present a middle-age man who was admitted with cauda equina syndrome for one day duration developing 11 years after a redo laminectomy for recurrent disc herniation and local stenosis. The MRI obtained urgently revealed significant overgrowth of the free fat graft that had been already used for prevention of scar formation. Piecemeal surgical removal of fat with clearance of the theca and the corresponding nerve roots result in steady but good recovery within a few weeks.

To our knowledge, although overgrowth of fat has been reported in other locations, but this is the first example occurring after its application at the site of laminectomy. Therefore, overgrowth of free fat graft should be added to all previously describe unusual complication of lumbar discectomy.

Keywords

Cauda equina syndrome; Lumbar discectomy; Epidural scar

Introduction

Lumbar discectomy is being done in increasing frequency worldwide where formation of epidural scar formation has been known as a common cause of its failure. Up to 20% of the patients undergoing lumbar discectomy might suffer from this complication. Rocca and Mc.nab were the first who reported the scenario of post-laminectomy peridural fibrosis and called it the laminectomy membrane [1].

Subsequently, preliminary experience indicating that adipose

tissue acts as a barrier to fibrosis was reported by Langenskiöld and Kiviluoto in two separate papers in 1976 [2,3]. Subsequently, In 1978, Barber et al. used a layer of free fat graft for prevention of epidural fibrosis formation for the first time [4].

In the same year, Keller demonstrates the fate of epidural free fat graft (FFG) [5]. Since then, several clinical studies in favor of epidural free fat graft application for reducing peridural fibrosis was published so far [6-9].

The general concept was that the graft's adipose tissue remodels in relation to the bony defect and acts like a greasy fluid permitting gliding of the roots and the dural sac on it [8].

Later, with popularity of fat transplantation either as an epidural barrier in neurosurgery or as a filler in plastic and reconstructive surgery, its natural behavior became more evident. Corresponding studies about the longevity and durability of transplanted adipose tissue showed that it remains alive despite shrinkage and reduction in size with time. The concept of survival of the grafted fat made the neurosurgeons to use it more and more with time. In particular, once the superiority of FFG in compare to other material was published [10].

However, the benefits derived from application of epidural fat graft became questionable when the uncommon early drawbacks of its application in a spectrum from acute radiculopathy to cauda equina syndrome were verified [11-18].

Later, with consideration of several new studies, its real value in prevention of postoperative scar tissue formation and late radiculopathy became more controversial [19-22].

A few unusual events, remote overgrowth of free fat with its significant increase in its volume was reported by plastic surgeons [23,24].

Recently in our practice, we faced a 49-year old male with remote cauda equina syndrome due to significant overgrowth of free fat graft which was used as an epidural layer eleven years earlier. Meticulous decompression of the theca and the nerve roots achieved with piecemeal excision of a large mass composed of adipose tissue result in steady but good recovery of the patient. To the best of our knowledge, enlargement of epidural free fat graft over time to such a considerable degree that can cause remote neurological deficit has been not reported previously.

Case Report

A 49-year-old male was admitted to our department because of pain and the weakness of the lower extremity for a 4 days and difficulty in voiding for 24 hours. In his past history, he had three time surgery for L5-S1 discectomy, partial laminectomy for L4-L5 stenosis and recurrent L5-S1 disc herniation and L4-L5 block in the last 17 years. The first two surgeries had been done in other hospitals but the last surgery was done in our department where after removal of the recurrent disc at L5 -S1 and laminectomy of L5 and partial L4, in order to prevent epidural fibrosis, the dura was covered with 4mm layer of fat, composed of free fat globules. On his recent admission, neurological examination revealed weakness of dorsiflexion ob both sides, with score of 3/5 on the right and 4/5 on the left. Ankle jerks

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were diminished bilaterally; hypoesthesia of saddle region was also present more on the left side. A Foley catheter had been already used because of urinary retention.

MRI demonstrate a rather large hyperintense mass starting at the laminectomy defect at L4L5 and extending to the fascia in T1-weighted images (Figure 1). T2-weighted images demonstrated the same mass with hyperintensity, compressing the corresponding roots and theca (Figure 2). Hyper intensity both in T1 and T2-weighted images were in favor of the overgrowth of free fat graft.

Exploration and decompressive surgery was proposed, being accepted by the patient and his family. Therefore, urgent intervention was started after general anesthesia and the patient in prone position.



Figure 1c: Sagittal view showing the mass compressing the dura at L4-L5 and L5-S1 levels.

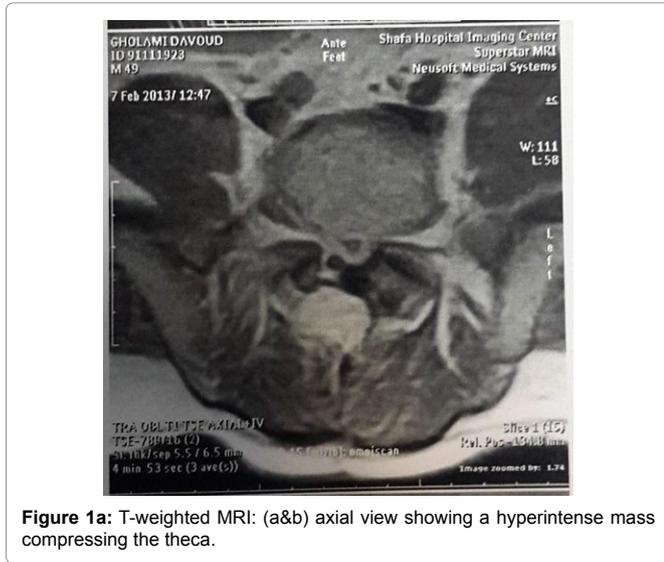


Figure 1a: T-weighted MRI: (a&b) axial view showing a hyperintense mass compressing the theca.

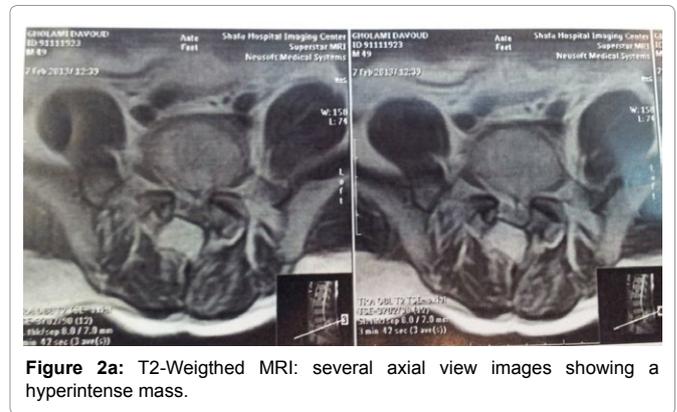


Figure 2a: T2-Weighted MRI: several axial view images showing a hyperintense mass.

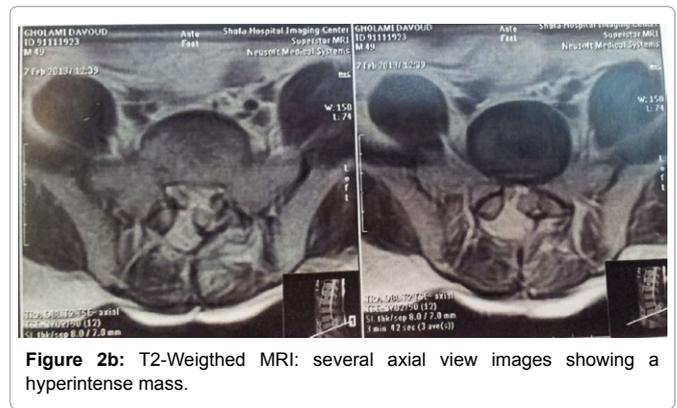


Figure 2b: T2-Weighted MRI: several axial view images showing a hyperintense mass.

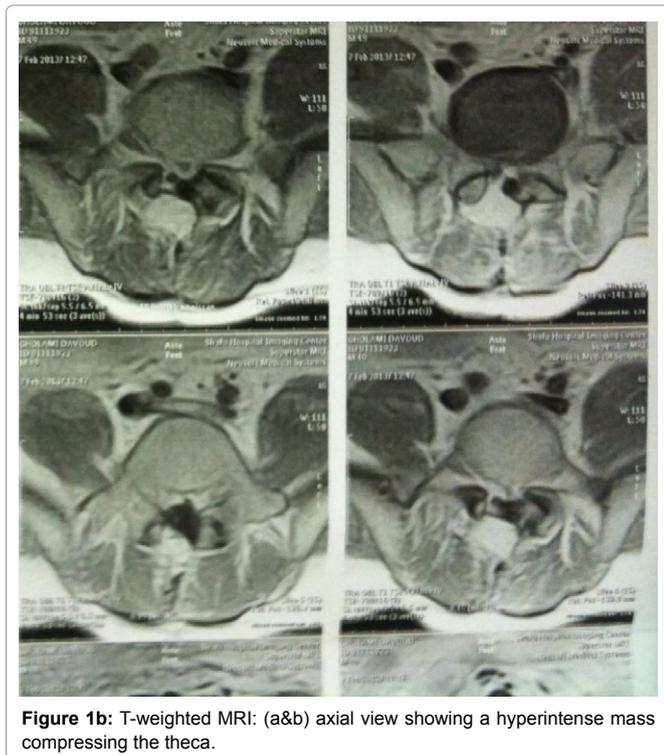


Figure 1b: T-weighted MRI: (a&b) axial view showing a hyperintense mass compressing the theca.

Via a midline incision, fascia was opened where on the left, side immediately after facial opening, an adipose mass was demonstrated. Initially, the adipose mass was dissected from the surrounding paravertebral muscles. In order to ease surgery, the posterior aspect of the mass was removed (Figure 3). Subsequently, the remaining fat tissue was removed in piece meal fashion till the dural and the corresponding roots at the depth of the field were demonstrated. With the aid of the microscope, its adhesions to the dura and L5 roots were meticulously detached as much as was possible. Thereafter, the wound was closed in three layers. Post-operative course was uneventful and motor function, sensory disturbances, voiding problems and sphincter control improved steadily within two months. Post-operative MRI obtained 3 months later showed no more adipose mass (Figure 4) (Supplementary Figures 1-4).



Figure 2c: sagittal view demonstrate the exact location of this mass.



Figure 3: The posterior side of the mass removed the more anterior part was excised in piece meal fashion.

Discussion

With popularity of lumbar disc surgery worldwide, the number of the cases being affected by failed back scenario or harboring unusual and rare complications have increased dramatically [25-29]. Postoperative epidural fibrosis is regarded as a major cause of failed back and recurrence of radiculopathy after lumbar discectomy. In the last two decades of the 20th century, the use of autogenous subcutaneous fat grafts in an attempt to prevent epidural and perineural fibroses after lumbar laminectomy became popular [1-9]. It was postulated that epidural fat graft can preserve epidural space from fibrosis, with positive effect in reducing the chance of failed back syndrome or making redo surgeries technically easier [1-9]. These effects were over emphasized to such an extent the many surgeons used it routinely after laminectomy. Subsequently, once it was shown that free fat graft (FFG) works well than other materials studied for reducing epidural fibrosis, its application became more accepted [10].

Parallel to these studies the natural fate of FFG regardless of the territory that it is used was assessed and this showed that transplanted adipose tissue survives despite its primary shrinkage [30-35]. In epidural space, based on animal surveys, the fat globules remains alive and are reshaped along the dura mater where its quality remains unchanged overtime. According to Kanamori et al. the size of the grafted fat is reduced to approximately 57% after 42 days, and to about 33% after 1 year [20-35]. This means that although fat grafts



Figure 4a: Post-operative MRI: T1-weighted sagittal image shows that all hyperintense mass has been removed.



Figure 4b: T2-weighted sagittal view.

remain alive, but they lose approximately 70% of its original size with time retaining the characteristic features of normal fat.

Viability and durability of transplanted free fat graft has been assessed both with CT scan and MRI [33-35].

Accordingly, in the early stage and within 6 weeks after surgery, the signal intensity of the grafted fat remains lower than that of normal subcutaneous fat tissue, but its intensity recovers by 1 year after surgery. Increasing experience has showed that free fat graft might be visible in MRI up to 18 years after utilization [35,36].

As was described earlier free fat graft has been used worldwide for about three decades, till one prospective double blind study and one prospective triple blind study found no significant clinical differences between the free fat-graft group and a control group [19-22].

With respect to the results of these studies, some surgeons proposed its abundance, relying on the increasing reports of serious early post-operative complications resulting from the compressive effect of free fat graft on the nerve roots and cauda equina [11-18].

With consideration of these facts which had stressed on postoperative neurological deficit and its inefficacy of in prevention of post-laminectomy fibrosis, application of FFG has become modified and limited to the defect of fenestration not exceeding than 4 mm in thickness.

Furthermore, with regard to our present case report, overgrowth of free fat graft should be added to the previously described complications [23,24]. It has been observed that transplanted free fat might continuously grow instead of shrinkage, a scenario that has been demonstrated clinically in plastic and ENT surgery where fat is used as a filler. In such circumstances, re-growth of the free fat graft is postulated to be due to its revascularization, the scenario that might be need periodic evaluation, both clinically and with repeat MRI. Otherwise, MRI should be done whenever new signs and symptoms of root compression appear and in particular urgently if cauda equina syndrome exist. In MRI a large pear-shape mass, with hyperintensity both in T1 a T2-weighted image is a clue and indicative of hypertrophied fat tissue.

Excision of such adipose pathology can be achieved with meticulous microsurgical piece meal removal of the mass and release of its attachments from the dura and affected nerve roots.

In conclusion, the complications of free fat graft placed over the dura should not be confined to early post-operative period. But, with regard to the current case, remote neurological deficit due to a considerable overgrowth of free fat graft should be regarded as another rare complication of lumbar disc surgery. The outcome might be satisfactory, if the surgical decision is made soon after appearance of new neurological deficit.

Ethical approval

Written informed consent was obtained from the patient for publication and corresponding images.

Consent

Written informed consent was obtained from the patient for publication and corresponding images.

Contribution

The steps of this article from design to writing were made by A. Rahimizadeh, S Rahimizadeh, Ava Rahimizadeh and Valliolah Hassani retrospectively.

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