THORACIC DISC HERNIATION: CASE SERIES AND PROTOCOL FOR SURGICAL APPROACHES

HÉRNIA DE DISCO TORÁCICO: SÉRIE DE CASOS E PROTOCOLO DE VIA DE ACESSO CIRÚRGICO

HERNIA DE DISCO TORÁCICO: SERIE DE CASOS Y PROTOCOLO DE ACCESO QUIRÚRGICO

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ABSTRACT

Objective: To describe the surgical results of a prospective series of five patients operated according to an approach indication protocol. Methods: Patients were classified according to surgical risk: Group A (high risk) or B (low risk) and subsequently into subgroups according to characteristics of the herniation and ultimately the surgical approach was defined: A.1) calcified central herniations - thoracoscopy; A.2) soft lateral herniations – posterolateral approach; A.3) centrolateral herniations - partial calcification in lateral position – posterolateral approach; higher density central calcification - thoracoscopy; B.1) central or centrolateral calcified herniations - thoracotomy or thoracoscopy; B.2) soft lateral herniations – posterolateral approach. Results: The duration of symptoms ranged from 2 months to 3 years; the age bracket was from 37 to 58 years; sex distribution was 3 female and 2 male patients and the length of hospital stay ranged from 2 to 20 days. The most affected level was T11/12. A patient classified as Group A.3 underwent posterolateral approach. The remaining patients were Group B.1, 3 submitted to thoracotomy and 1 to thoracoscopy. The herniation removal was completed in 5 cases; 3 patients improved and 2 remained stable. The morbidity and the recovery time were higher in patients who underwent anterolateral approaches. Conclusions: Classify patients according to surgical risk and the anatomical characteristics of disc herniation allows for complete decompression, minimizing morbidity and mortality.

Keywords: Intervertebral disk/surgery; Thorax; Decompression, surgical; Intervertebral disc displacement; Risk groups; Morbidity; Laminectomy/methods; Thoracotomy; Thoracoscopy.

RESUMO

Objetivo: Descrever os resultados cirúrgicos de uma série prospectiva de cinco casos, operados segundo um protocolo de indicação de vias de acesso. Métodos: Os pacientes foram classificados conforme o risco cirúrgico: Grupo A (alto risco) ou B (baixo risco); posteriormente, foram divididos em subgrupos, conforme características da herniação e, por fim, definiu-se a via de acesso cirúrgico: A.1) hérnias centrais calcificadas - toracoscopia; A.2) hérnias laterais moles - via posterolateral; A.3) hérnias centrolaterais - calcificações parciais de posição lateral - via posterolateral; calcificação de maior densidade e central – toracoscopia; B.1) hérnias centrais ou centrolaterais calcificadas – toracotomia ou toracoscopia; B.2) hérnias laterais moles – via posterolateral. Resultados: A duração dos sintomas variou de dois meses a três anos; a faixa etária foi de 37 a 58 anos; a distribuição por sexo foi de três pacientes do sexo feminino e dois do sexo masculino e o tempo de internação variou de dois a 20 dias. O nível mais acometido foi T11/12. Um paciente classificado como Grupo A.3 foi submetido à via posterolateral. Os demais pacientes foram Grupo B.1, três submetidos à toracotomia e um à toracoscopia. A remoção da herniação foi completa nos cinco casos; três pacientes melhoraram e dois permaneceram estáveis. A morbidade e o tempo de recuperação foram maiores nos pacientes submetidos às vias anterolaterais. Conclusões: Classificar pacientes de acordo com o risco cirúrgico e as particularidades anatômicas da herniação discal permite obter descompressão completa, minimizando a morbidade e a mortalidade.

Descritores: Disco intervertebral/cirurgia; Tórax; Descompressão cirúrgica; Deslocamento do disco intervertebral; Grupos de risco; Morbidade; Laminectomia/métodos; Toracotomia; Toracoscopia.

RESUMEN

Objetivo: Describir los resultados quirúrgicos de una serie prospectiva de 5 casos utilizando un protocolo de indicación de las vías de acceso. Métodos: Los pacientes fueron clasificados de acuerdo con el riesgo quirúrgico: Grupo A (alto riesgo) o B (bajo riesgo); luego se dividieron en subgrupos según las características de la hernia y, finalmente, se definió la vía de abordaje quirúrgico: A.1) hernias centrales calcificadas - toracoscopía; A.2) hernias laterales blandas - vía posterolateral; A.3) hernias centrolaterales - calcificaciones parciales en posición lateral - vía posterolateral; calcificación más densa y central - toracoscopía; B.1) hernias centrales o centrolaterales calcificadas - toracotomía o toracoscopía; B.2) hernias laterales blandas - vía posterolateral. Resultados: La duración de los síntomas fue de 2 meses a 3 años, el rango de edad fue de 37-58 años, la distribución por sexo fue 3 mujeres y 2 hombres y la duración de la estancia hospitalaria varió de 2 a 20 días. El nivel más afectado fue el T11/12. Un paciente clasificado como Grupo A.3 se sometió a la vía posterolateral. Los demás pacientes fueron del grupo B.1, con 3 sometidos a toracotomía y uno a toracoscopía. La eliminación de la hernia fue completa en 5 casos; 3 pacientes mejoraron y 2 se mantuvieron estables. La morbilidad y el tiempo de la recuperación fueron mayores en pacientes operados por la vía anterolateral. Conclusiones: Clasificar a los pacientes según el riesgo quirúrgico y las características anatómicas de la hernia de disco, permite la descompresión completa, lo que reduce al mínimo la morbilidad y la mortalidad.

Descriptores: Disco intervertebral/cirugía; Tórax; Descompresión quirúrgica; Desplazamiento del disco intervertebral; Grupos vulnerables; Morbilidad; Laminectomía/métodos; Toracotomía; Toracoscopía.

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INTRODUCTION

The first reports of thoracic disc herniation were published by Key[1] in 1838 and by Middleton and Teacher[2] in 1911 and the first review of surgical cases was published in 1936 by Hawk.[3] Since that time, several access approaches have been described, but there is still no "gold standard" for the treatment of this pathology.

The incidence of thoracic disc herniation with neurological deficit is 1/1,000,000,[4,5] though incidental magnetic resonance findings are 10-20%.[6,7] Surgical indications for this pathology are rare, corresponding to between 0.15 and 4% of disc herniation surgeries.[8]

Relevant clinical aspects of this pathology are its association with Scheuermann's disease and trauma, and the fact that it more often affects males between 40 and 70 years of age.[9]

The presence of intradiscal calcifications is characteristic, occurring in 60% of cases, and is a critical factor in determining the best surgical access approach.[10-12] Approximately 75% of thoracic disc hernias are located below T8, primarily at T11-T12.[13]

The most common initial clinical manifestation is back pain, a nonspecific symptom, in most cases related to a delayed diagnosis.[14] Radiculopathy is another form of presentation and evolves with radiating pain and hypoesthesia of the intracostal dermatome, but the absence of myotomes in the region and the fact that thoracoabdominal pathologies may have similar symptoms can also lead to a late diagnosis.[15] Myelopathy is the most common form of presentation in clinical practice, in the context of an investigation of crural paraparesis, changes in sensitivity at the thoracic level, and sphincter changes.[16]

Neuroimaging is the most important complementary examination. MRI is the most accurate, but radiography and computed tomography are fundamental to our definition of the characteristics of the calcification when present.[17]

In the literature, the surgical indications are myelopathy (70%), untreatable radiculopathy (24%), and refractory axial pain (6%).[18-20] While surgery is the absolute indication for myelopathy, patients with pain, but without neurological deficits, should be treated conservatively. Patients with refractory pain should be individually considered for invasive procedures, as radicular pain responds better to surgical treatment than axial pain.[20]

The natural history of patients with incidental herniation is to remain asymptomatic. Most of them present reduced hernia volume in MRI series.[7,17,21]

The small space available for the spinal cord in the thoracic segment, associated with poor blood supply, increases the risk of neurological worsening after surgical compression.[22-24] The most relevant criteria in choosing the best surgical approach are related to the clinical condition of the patient and the characteristics of the herniation.[14,25]

The posterior approach laminectomy was widely used in the 50s, with catastrophic results and serious neurological worsening in 70% of cases.[26-28]

The anterolateral (transthoracic, thoracoscopic, retropleural thoracotomy) and lateral (extracavitary lateral, costotransversectomy, and parascapular) approaches require: 1) Large muscular dissections or thoracotomy; 2) Rib removal; 3) Need to detach the diaphragm in thoracoabdominal approaches; 4) Postoperative drainage of the thorax; 5) Significant postoperative pain. However, they allow optimum access to the intravertebral disc and are the surgical access of choice for anterior and calcified herniations.[22,25]

Posterolateral approaches began to emerge in the literature in 1978, when Petterson and Arbit[29] described the transpedicular approach, an access that enabled the removal of soft lateral disc hernias. In 1995, Stillerman et al.[30] described the transfacet approach, a variation of the posterolateral, which allows to remove not only the soft lateral herniations, but also partially calcified centrolateral hernias. This approach has the advantage of low morbidity, less hospitalization time, anatomic facility for spine surgeons, without the need for an access surgeon.

The patient's surgical risk is fundamental to defining the access route. Patients with high surgical risk are candidates for the approaches with lower morbidity, such as posterolateral or thoracoscopic.

The objective of this study is to describe the surgical outcomes of a prospective series of five consecutive cases, all with at least one year of postoperative follow-up, who underwent surgery in accordance with the approach protocol pre-established in our service.

METHOD

In January, 2010, we established a protocol for indicating the surgical approach for hernias of the thoracic discs based on a literature review and the experience of our service.

During the period from February, 2010, to January, 2011, five patients between 37 and 58 years of age, three of them female, two of them male, all with myelopathy, one with radicular pain and another with axial pain, with symptoms from two months to three years in duration, and calcified herniations between T7 and L1, underwent surgery in compliance with the criteria established in the protocol. All of them were informed about the standard surgical treatment of the institution and signed the Informed Consent Form. Submission to the Ethics Committee was not required because the study design was based on the cohort study with surgical techniques previously described and sanctioned by the current literature at the time of the study.

The University does not require the ethics committee for case series articles.

Protocol

We only indicate surgery for patients with myelopathy or refractory radiculopathy. Patients with axial pain are not treated with surgery to remove the disc hernia.

We divided the patients into Groups A and B, by surgical risk. We subdivided the groups according to the location and calcification of the disc herniation:

Group A - Patients with high surgical risk: 1) Calcified central hernias - treated with thoracoscopy; 2) Soft lateral hernias - treated by posterolateral (transfacet or transpedicular) approach; 3) Centrolateral hernias - we evaluate the calcification. Partial lateral-position calcifications can be treated via posterolateral approach. For central hernias with calcification of greater density, we opt for thoracoscopy.

Group B - Patients with low surgical risk: 1) Calcified central or centrolateral hernias - thoracotomy or thoracoscopy; 2) Soft lateral hernias - posterolateral approach.

Our surgical indication protocol was not based on our experience, which was inadequate for such a proposal. It was based on an ample review of the literature, in which we systematized and simplified the indications by the groups and subgroups (A1, A2, A3, B1, and B2) described above.

Our recommendation, and that which we have been following in our service since then, is to classify the patients by High or Low surgical risk (Group A or Group B) as a way to determine the importance of avoiding approaches with high morbidity in high surgical risk patients. Using this principle, for patients with high surgical risk and soft lateral hernias (subgroup A2), we recommend removal of the hernia by posterolateral approach because of its lower morbidity. In high risk cases with centrolateral hernias (subgroup A3), we observe the location and the degree of calcification. Those that are more lateral and not very calcified can be removed by posterolateral approach. According to the literature, those that are central and calcified should be removed by the thoracic approach, but in this case, because the risk is high (A3), our first choice is thoracoscopy, which we also recommend for subgroup A1 (high risk and calcified central hernia).

For patients in Group B (low surgical risk) we include thoracotomy as an option because the patient is in good condition for this type of postoperative experience. Thus, a calcified central hernia, for which, according to the literature, the preferred approach is the thorax, can be removed via thoracoscopy or thoracotomy according to the surgeon's preference. In the case of soft lateral

hernias (subgroup B2), the literature reports optimum results with the posterolateral approach, as it did not make sense, even in low risk patients (Group B), to operate using the anterior approach.

In terms of the costotransversectomy or extracavitary lateral access, the literature reports morbidity and mortality similar to those with thoracotomy and the surgical access for calcified central hernias is poor. For this reason, we do not see any advantage to these approaches.

RESULTS

The average patient age was 41 years. The duration of related symptoms was from two to 36 months, but no correlation was found between the duration of symptoms and the degree of calcification of the hernias. Myelopathy of Frankel C or D was present in 100% of the cases. In all cases, there was total removal of the hernia. (Table 1)

Only one patient, with a partially calcified hernia, more densely calcified in the lateral portion, was considered a high surgical risk. (Figure 1) He underwent posterolateral transfacet approach surgery (subgroup A3). The other patients presented low surgical risk, all with calcified central hernias (subgroup B1), three of whom underwent thoracotomy (Figure 2) and the other thoracoscopy, respecting the experience of each surgeon.

The removal of the herniation was total in the five cases, however, the patient who underwent thoracoscopy required a second intervention via the same approach because of no clinical improvement and the presence of a residual hernia in the immediate postoperative control examination. (Figure 3)

The postoperative evolution time was a minimum of 12 months and a maximum of 24 months. During this period, two patients presented the same deficits as they did preoperatively, one remaining at Frankel scale C and continued axial pain and the other at Frankel scale D. The other three patients showed postoperative improvement. One, who was classified as Frankel scale D preoperatively, was Frankel scale E after 12 months of evolution. Another, classified as Frankel scale C preoperatively, was classified as Frankel scale D after 18 months of follow-up. In addition, the third, with Frankel scale D and with grade IV crural paraparesis in the preoperative period, was still at Frankel D, but with grade IV+ muscular strength and improvement of radicular pain after 23 months.

DISCUSSION

This small case series had a higher incidence among females, but a higher incidence in males is established in the literature.[9] The greater incidence in the low thoracic region, near the thoracolumbar transition, and the age range agree with the literature data.[9,13]

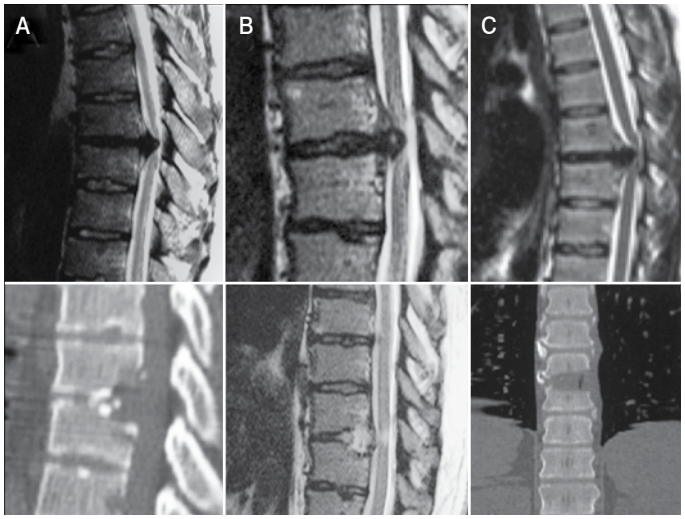

Figure 1. Pre- and postoperative imaging of patients who underwent thoracotomy. (A) Patient five in Table 1; B) Patient 2 in Table 1; (C) Patient 4 in Table 1.

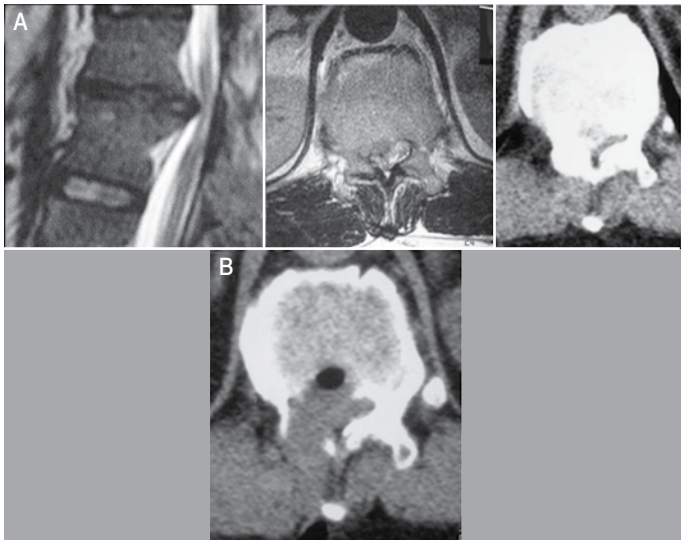

Figure 2. Preoperative imaging shows a calcified centrolateral hernia, predominantly in the lateral portion. Postoperative CT shows complete removal via the posterolateral approach (Patient 1 in Table 1).

Table 1. Clinical data of the five patients evaluated.

Age	Sex	Clinical Pre	Duration of symptoms	Location	Calcification	Group	Access Route	Clinical Post	Surgical removal
43	M	RP	36m	T11-12	CL	A.3	PL	+ 23m	T
		Mp							
		FD			Pc				
38	F	Mp	6m	T10-11	C	B.1	Tt	+ 18m	T
		FC			Tc				
30	F	AP	2m	T7-8	C	B.1	Tcs	= 24m	T*
		Mp							
		FC			Tc				
37	M	Mp	4m	T12-L1	C	B.1	Tt	+ 12m	T
		FD			Tc				
58	F	Mp	6m	T11-12	C	B.1	Tt	= 20m	T
		FD			Tc				

Key. M – Male, F – Female, RP – Radicular Pain, AP – Axial Pain, Mp – Myelopathy, F – Frankel Scale (A to E), m – time in months, CL – Centrolateral, C – Central, Pa – Partially calcified, To – Totally calcified, PL – Posterolateral, Tt – Transthoracic, Tcs – Thoracoscopy + improvement, = no change, T – Total. *Total removal following surgical reintervention.

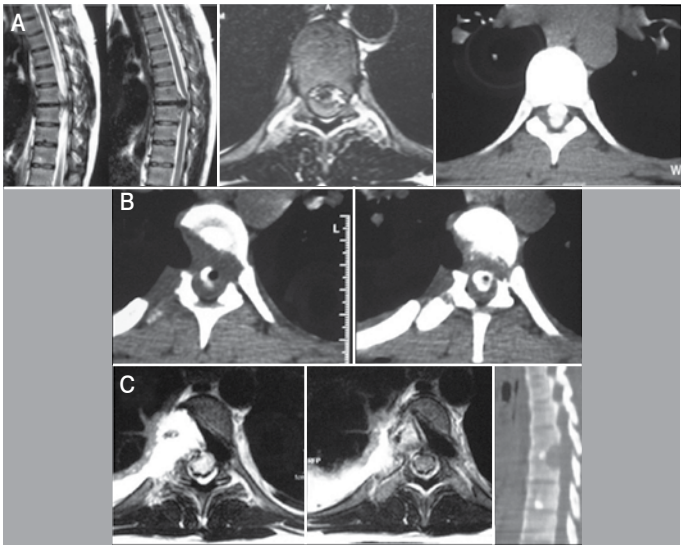

Figure 3. Pre- and postoperative imaging exams: (A) Sagittal/axial MRI in T2 and CT show a calcified hernia of the central thorax with medullary compression; (B) Postoperative CT showing partial removal of the herniation; (C) MRI and CT following the second surgery showing complete resection of the disc hernia (Patient 3 in Table 1).

All the patients had calcified herniations, while the rate in the literature is 60%,[10-12] but this can be explained by the small number of cases and by the fact that these patients had been admitted after a prolonged period of disease and with myelopathy already clinically established.

The choice of the best surgical approach was determined by the familiarity of the surgeons and the literature review. We did not use the lateral approaches (extracavitary lateral, costotransversectomy) for low thoracic hernias because the postoperative morbidity is similar to that of the anterolateral approaches and access to the center of the disc is poor.[22,25] In this series, all the patients who underwent anterolateral approach surgery required thoracic drainage and an access surgeon. Postoperative pain was greater in patients submitted to thoracotomy as compared to those who underwent thoracoscopy or posterolateral approach surgery.

Hospitalization time ranged from a minimum of two days to a maximum of twenty days. The patient with the longest hospitalization time underwent a thoracoscopy that required surgical reintervention on the second postoperative day due to partial removal of the herniation. Nonetheless, this patient had the worst neurological condition of the series, which contributed to the longer in-hospital recovery time.

Only one patient underwent posterolateral approach surgery. The patient had serious comorbidities (uncontrolled arterial hypertension, diabetes mellitus, and morbid obesity), but the characteristics of the herniation made it possible to avoid an anterior approach. This patient had the shortest hospitalization time, being discharged on the second postoperative day, with improved axial pain and muscular strength at the time of discharge. The posterolateral approach has the advantage of low morbidity and the anatomical familiarity of spine surgeons who do not need an access surgeon to perform it.[29,30]

The worst evolutions were associated with age, preoperative neurological deficit, and the need for reintervention. In the literature, a long duration of medullary compression and a poor preoperative neurological status are prognostic markers of a worse evolution.

CONCLUSION

The treatment of thoracic disc herniation continues to be a challenge for surgeons due to the large number of access approaches described, none of them considered the "gold standard".

Classifying patients according to surgical risk and the anatomical peculiarities of the disc herniation allow the surgeon to choose the most suitable approach for each patient, minimizing morbidity and mortality and achieving complete decompression. This is primarily valid for patients with high surgical risk, who are candidates for posterolateral approach, except when there is calcified central herniation, in which case we prefer the thoracoscopic approach.

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