Infection rate in 212 consecutive patients treated by minimally invasive lumbar tubular decompression

Nicolás Coombes, Eduardo Galaretto, Juan Pablo Guyot, Norberto Fernández, Cristian Fuster
Axial Grupo Médico (Buenos Aires, Argentina)

ABSTRACT

Introduction: Surgical site infections (SSI) can lead to prolonged antibiotic treatments, increased hospital stays, and repeated operations. Small incisions and the possibility of avoiding subperiosteal dissection in minimally invasive surgery can minimize the risk of postoperative infections. However, there is a shortage of literature on infections after mini-invasive procedures. **Objective:** To evaluate retrospectively a series of patients consecutively operated on with minimally invasive technique and the incidence of postoperative infection. **Materials and Methods:** Patients undergoing posterior lumbar surgery with tubular retractors and microscope in our department between January 2015 and January 2018 were included. The procedures performed included tubular discectomies, lumbar stenosis decompressions, and synovial cyst resections. The incidence of postoperative SSIs was calculated and compared with the literature range for SSI rates. **Results:** A total of 212 patients underwent non-instrumented surgeries (discectomies, decompressions). The mean age was 62.4 years with a male:female ratio of 1.27:1. Only one patient had SSI, which was diagnosed on day 9 and treated by reoperation, surgical toilet of the wound, and antibiotic therapy. **Conclusion:** The infection rate was 0.47%. Minimally invasive surgery can significantly reduce the SSI rate and can be an effective tool in minimizing hospital costs.

Key words: Minimally invasive surgical procedures, decompression, discectomy, surgical wound infections.
Level of Evidence: IV

Tasa de infección en 212 pacientes consecutivos tratados mediante descompresión tubular mininvasiva de la columna lumbar

RESUMEN

Introducción: Las infecciones del sitio quirúrgico pueden requerir tratamientos prolongados con antibióticos, una estancia hospitalaria más prolongada y operaciones repetidas. Las incisiones pequeñas y la posibilidad de evitar la disección subperióstica en la cirugía mininvasiva pueden reducir, al mínimo, el riesgo de infecciones posoperatorias. Sin embargo, los estudios publicados sobre infecciones después de procedimientos mininvasivos son escasos. El objetivo de este estudio fue evaluar retrospectivamente una serie de pacientes operados, de manera consecutiva, con una técnica mininvasiva y la incidencia de infección posoperatoria. **Materiales y Métodos:** Se incluyó a los pacientes sometidos a cirugía lumbar posterior con retractores tubulares y microscopio, en nuestro Servicio, entre enero de 2015 y enero de 2018. Los procedimientos realizados fueron discectomías tubulares, descompresiones para la estenosis de canal y resecciones de quistes sinoviales. La incidencia de infección del sitio quirúrgico se calculó y comparó con el rango de tasas de infección del sitio quirúrgico publicado. **Resultados:** Se realizaron cirugías no instrumentadas (discectomías, descompresiones) en 212 pacientes. La media de la edad era de 62.4 años y la relación hombre:mujer, de 1,27. Solo un paciente sufrió una infección del sitio quirúrgico, diagnosticada el día 9 poscirugía, que fue tratada mediante lavado y limpieza de la herida. **Conclusión:** La tasa de infección fue del 0,47%. La cirugía mininvasiva puede disminuir notablemente la tasa de infección del sitio quirúrgico y puede ser una herramienta eficaz para reducir, al mínimo, los costos hospitalarios.

Palabras clave: Procedimientos quirúrgicos mininvasivos; descompresión; discectomía; infecciones de heridas quirúrgicas.
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Received on August 17th, 2019. Accepted after evaluation on December 19th, 2019 • NICOLÁS COOMBES, MD • nicolascoombes@gmail.com https://orcid.org/0000-0002-9241-6083
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INTRODUCTION

SSIs are complications dreaded by spine surgeons since their morbidity and mortality rates are significant, ranging from 1.9% to 5.5%.[1-4] Such variability may be associated with an inadequate registry of infectious complications, which may not be recorded, resulting in highly variable rates.[5-7]

Spine SSIs may be serious complications as they may prove difficult to treat and may require prolonged hospital stays, specific intravenous antibiotic therapy, reoperations for wound debridement, or hardware removal.[8]

SSIs incidence should be reduced as much as possible. Minimally invasive spine surgical (MISS) techniques involve a smaller corridor to access the spine and reduce tissue destruction, blood loss, hospital stays, and postoperative morbidity.[9,10] Only a small number of studies have analyzed SSI incidence following MISS procedures.[11-13]

The objective of this study was to evaluate the SSI rate in a series of patients operated on consecutively with non-instrumented minimally invasive lumbar tubular decompression procedures performed by the same surgical team, analyze the results, and compare them to the literature.

MATERIALS AND METHODS

This study was a retrospective evaluation of all consecutive patients undergoing lumbar MISS from January 2015 to January 2018. Lumbar MISS was defined as spinal surgery using a tubular retractor system with the aid of an operative microscope. All surgeries were performed by the same surgical team.

The pre-operative protocol included home-based bathing with chlorhexidine soap as decontamination procedure, for 3 days before hospitalization.

Patients were placed in the prone position on the operating table for surgery and were administered general anesthesia. Surgical site was scrubbed using chlorhexidine cloths and shaved during surgery whenever necessary. Disposable adhesive surgical drapes were placed in a caudal-to-cranial disposition. As last step, the surgical site was covered with an iodine-impregnated incision drape. Up to the last step, the surgical team wore double gloves. All procedures were performed using 18 to 26 mm-diameter tubular retractors (METRx System, Medtronics, Memphis, TN, USA).

All patients received a preoperative antibiotic (third-generation cephalosporin) an hour before surgery.[8] The microscope and the image intensifier were carefully raped with sterile covers. Tubular discectomies were performed with 18 and 22 mm-diameter tubes, and lumbar stenosis tubular decompressions with 22 and 26 mm-diameter tubes. Cephalosporin administration was repeated only once after surgery. Most patients mobilized 3-4 hours after surgery. Patients with dural lesions and cerebrospinal fluid leaks mobilized the first post-operative day.

Postoperative infection was defined according to clinical signs, including persistent wound drainage, lumbar pain, elevated inflammation parameters (WBC count, erythrocyte sedimentation, C-reactive protein), and MRI scanning. Patients with infections were considered fully recovered only when two consecutive inflammation markers were negative through at least a 15-day period associated with clinical improvement.

RESULTS

Our study included 212 patients (119 males and 93 females), and a total of 257 disc-level decompressions. Preoperative mean age was 62.4 years (range, 14-86) with a male:female ratio of 1.27:1.

Patient diagnoses were: stenosis (103 cases, 48.58%), lumbar disc herniation (74 cases, 34.9%), and synovial cysts (35 cases, 16.5%).

Mean operative time was 60 ± 25.4 min (for each level). A single approach was used in 91.6% of patients and 8.4% underwent multiple approaches (more than 2). Time from beginning of surgery to infection detection was 9 days.

Only 1 infection was diagnosed (0.47%). The case was a revision surgery; the patient had undergone primary surgery a year before. This procedure warranted a combined approach as it involved multi-segmental decompression in a patient with multi-level stenosis.

Following the infection diagnosis, the patient underwent surgical toilet and debridement, including sampling for bacteriological culture. The patient remained hospitalized and received antibiotic therapy. The bacteriological culture was positive for *Staphylococcus aureus* susceptible to methicillin, and outpatient antibiotic therapy prescribed.

DISCUSSION

SSIs associated with spine surgery can lead to dangerous complications and worsen clinical outcomes.[1,2] Reported SSI rates following an open spine surgery (OSS) range from 0.7% to 5.5%[1-6] and rates for non-instrumented tubular decompression range from 0.09% to 0.22%.[11-13]

OSSs require large incisions, extensive soft tissue resection, and wider retraction. The resulting iatrogenic morbidity has been very well established.[14] A paradigm shift has occurred from the subperiosteal resection and excessive muscle retraction to the progressive dilatation of soft tissue using the sequential dilators and tubular retractors.[7,15] Since Foley and Smith began using tubular retractors in the late 1990s, several authors have tried to determine the infection rates following MISS.[11-13,16]

Probable reasons for lower infection rates following MISS include the use of a small surgical corridor, reduction in the exposed surface area, and reduction in dead space.[15] Less muscle retraction means less ischemia, less necrosis, and better wound healing potential. More restricted surgical fields lead to less exposure to potential pathogens and reduce disturbances and skin flora as they are guarded by tubes.[11] The shorter hospital stays observed with MISS may also reduce the exposure to hospital-acquired pathogens. However, there are concerns regarding the learning curve surgeons face during their initial steps with these systems.[12,17] Longer operative times and a steep learning curve may result in the infection rate differences observed at different centers. Therefore, a consensus statement may only be issued after conclusive evidence of lowered SSI rates is established by centers and spine surgeons across the globe.

The only SSI case of this series was diagnosed in the early postoperative period (9 days), and the pathogen was *S. aureus*, which corresponds to other reposted series.[9,13,14]

Patients undergoing OSS are 5.77 more likely to develop SSI than those undergoing MISS.[14]

O'Toole *et al*. studied SSIs following MISSs and reported a 0.10% incidence for non-instrumented surgeries.[13] Shousha *et al.* conducted a large study with 4350 cases of non-instrumented MISS and reported a 0.09% infection rate.[11]

In line with the literature, our observations strengthen the conclusions that MISS reduces SSI rate and also postoperative morbidity.[4,8,9]

Although our population study was significantly smaller than those of other reported series, our infection rate is consistent with the literature infection rate, and if we only consider primary surgeries, the infection rate was 0%, the only SSI case being a revision surgery.

Image intensifier plays a major role in the successful execution of MISSs. In our practice, we only drape the upper portion of the image intensifier and secure its sterility throughout the surgical procedure. The lower portion of image intensifier undergoes constant position changes that can be a potential source of contamination. We drape the lower portion of the C-arm only when the image intensifier is placed for lateral exposure.

Bible *et al*. studied the sterility of operative microscopes and observed that they constitute a significant source of contamination. Draping of the microscope using sterile covers and exercising aseptic precautions while handling the eyepiece help reduce contamination.[18] We change our gloves every time after manipulating the optical eye piece and avoid contact with the portion of the drape above the optical eye-piece.

Infections after OSS increase the health-care costs by four-fold.[14] Al-Khouja *et al*. reported a 33% to 2.54% reduction in costs between MISS and OSS.[17] Therefore, in the current era of cost-effectiveness and cost-analysis, MISS holds a promising place in reducing the overall health-care cost.

The limitations of this study include: only one patient developed an infection (a revision-surgery case) and, thus, a valid conclusion regarding the risk factors cannot be extracted; the study population was significantly smaller than those reported in the literature; we did not have an OSS-control group as all patients had undergone MISSs. We consider necessary large case-control trials for further evaluation.

CONCLUSIONS

Infection rate following tubular-microscopic-assisted spinal surgery was very low (0.47%). MISS technique markedly reduces postoperative infection risk when compared with large OSS series published in the literature while also being an effective tool to minimize hospital costs and patient morbidity and mortality.

Conflict of interests: Authors claim they do not have any conflict of interests.

E. Galaretto ORCID ID: https://orcid.org/0000-0003-4121-8228
J. P. Guyot ORCID ID: https://orcid.org/0000-0001-6524-4426
N. Fernández ORCID ID: https://orcid.org/0000-0002-5250-5399
C. Fuster ORCID ID: https://orcid.org/0000-0002-5293-0846

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