LATE EFFECTS AND COMPLICATIONS OF SUBLAMINAR WIRE APPLICATIONS

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499 sublaminar wire applications were done in the operations of 58 patients with different vertebral disorders between 1985 and 1993. 0,9 mm wires were used in all of these operations and all operations were performed by the same surgeon. The number of sublaminar wires used for each patient varied from 1 to 26. Cerebrospinal fluid leakage from the incision site and infection due to this fistula was observed in one patient on 3rd postoperative day. Harrington rod and sublaminar wires of this scoliosis patient were extracted 9 months after the surgery. Late infection occurred in another patient. No major neurologic complication was observed in any of the patients. During a mean follow-up period of 55 (12-91) months, 17 of these 499 (3,4%) wires were found to be broken. The level of the broken wires were found to be either the most proximal or the most distal segments. We did not observe any neurologic deficits or any pathological changes in the adjacent tissues at final clinical and radiological evaluation of the patients. In conclusion, the use of sublaminar wires can be performed with a low incidence of complications if proper technique is used.

Key Words: *Sublaminar wire, complications*

INTRODUCTION

Sublaminar wire applications has been popularized with studies of Eduardo Luque in the late 1970's and various types of systems based on sublaminar wiring was developed since then. This method, which created some serious doubts because of its high complication rates at the beginning, is now a component of many spinal treatment techniques and proved itself as a rescuer in spinal surgery[1,2,3,7,8]. As having one of the largest series in our country, we have decided to investigate the long-term follow-up results and complications of sublaminar wire applications which is used widely in all over the world.

MATERIALS AND METHOD

58 patients who were underwent spinal surgery with sublaminar wire applications for the treatment of different spinal disorders between 1985 and 1993 were investigated. It was found that 499 sublaminar wire applications had been done in the operations of these patients. List of types of operations and distribution of broken wires are given in Table 1.

Mean follow up was 55 months (12-91). 0.9 mm ordinary cerclage wires were used in all of these operations. Sublaminar wire applications were performed by the same surgeon in all of the operations by using the classical procedure (i.e. from distal to proximal on the midline). Sublaminar wiring was tried to be done as in one movement as possible. Sublaminar wiring of the sacral region in the patients treated with Galveston system was performed by drilling the sacrum with the instruments of Hartshill System and passing the wires through these openings.

A CT scan or MRI was performed prior to surgery when a spinal cord disorder or a narrow spinal canal was suspected and sublaminar wiring was not done if a pathological finding was present.

No significant difficulty was encountered during application of sublaminar wiring and all planned wires were successfully put into place. Wire stretching and bending were done under tension with special instrument. As spinal monitoring was not available in our operating theater, the wake-up test was applied for every patient except paraplegic ones and cases with a neuromuscular disorder.

COMPLICATIONS

Minor changes during sublaminar wiring could not be detected due to the lack of spinal monitoring. Postoperative complication criteria were based on subjective complaints of the patient and physical examination findings.

No tear of the dura mater during wiring and cerebrospinal fluid leakage due to this fact was observed. Cerebrospinal fluid leakage and secondary infection was observed as an early complication in a patient with lumbar scoliosis treated with Harri-Luque procedure on the 3rd postoperative day. Rods and wires of this patient who had no neurologic complication were extracted to control the infection 9 months postopera-

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Table 1. Distribution of broken wires according to the operation types.

Type of treatment	Number of patients	Number of sublaminar wires	Number of broken wires
Luque	19	252	9
Harri-Luque	31	111	4
Galveston-SSI	3	57	4
Galveston-SSI + anterior Alıcı	2	34	-
Luque + Zielke	2	28	-
Galveston-SSI + Zielke	1	17	-

tively. Late infection occurred in another patient with Harri-Luque instrumentation and respond to appropriate antibiotic therapy.

Most frequently observed late complication was wire breakage. 17 out of 499 wires were found to be broken in an average follow-up period of 55 months. The level of the broken wires were found to be either the most proximal or the most distal segments of the patients treated especially with the Luque procedure.

We did not observe any neurologic deficit due to the wire breakage in the late follow up, but there were varying degrees of correction loss in these patients and some problems like palpation of the implant under the skin were met.

In the radiological examination all wire breakage points were found to be in the wire and lamina intersection regions. No breakage in the sublaminar segment was found. Any cut or fracture of the laminas which were subject to wiring could not be detected.

As we used wires made up standard stainless steel, we could not obtain CT scans or MR images of the patients. No patient had a complication which necessitated myelography, so we could not have any visual evidence of effects of the sublaminar wires on the spinal cord and other soft tissues.

DISCUSSION

There are many studies in the literature reporting early complications of sublaminar wiring[1,2,3,5,6,7,8]. Most of these complications were found to occur during wiring procedure and these could be observed by spinal monitoring.

In some animal studies related to sublaminar wiring, anteroposterior diameter of the spinal canal and the distance between adjacent laminae were investigated[6]. We observed that interlaminar distance is narrow in rabbits and spinal cord injuries resulted in major neurologic complications frequently during sublaminar wiring[4]. It was shown that human spine had a greater anteroposterior spinal canal diameter and a shorter lamina length than lamb or pig spine. This can explain the difference between the results of animal experiments and human applications.

We investigated the effects of sublaminar wires on the surrounding tissue in the early postoperative period in an animal study and we found that the edema occurring immediately after the wiring procedure in the peridural tissue resolves within 2 months, no new bone formation occurs and wires become surrounded with normal peridural tissue at the end of 3rd month[4].

The level of the 17 broken wires in our series of 499 sublaminar wires were found to be either the proximal or the distal segments. Any symptoms due to the wire breakage has not been observed yet. The shortness of the fusion in proximal or distal segments may be the cause of this fact.

The main reason for the breakage of the wire is the lack of fusion rather than the mechanical properties of the implant material. Of the wire is able to withstand the fusion period, the possibility of breakage diminishes spontaneously after the fusion is complete. The late breakage of the sublaminar wires is not very dangerous, because major complications due to wiring generally occurs during the procedure[2,5,7,8].

The point that there is no major complication in 499 sublaminar wiring shows that careful application may prevent unwanted results, but it must be kept in mind that sublaminar wiring is not a procedure without the possibility of serious hazards to the patient.

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