Thesis

Comparative Outcomes of Simultaneous Versus Staged Decompression in Tandem Spinal Stenosis: A Retrospective–Prospective Analysis

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Abstract

Background: Tandem spinal stenosis — symptomatic narrowing at both the cervical and lumbar levels — often produces a confusing mix of arm and leg symptoms and walking difficulty. Deciding whether to operate on both regions in one sitting or in separate staged procedures is a common clinical dilemma, especially in older patients with other medical problems.

Methods: We reviewed 23 patients treated for clinically and radiologically confirmed tandem cervical and lumbar stenosis between August 2015 and August 2016. Pre- and postoperative assessment used standard tools (JOA for cervical and lumbar function, European myelopathy score and SF-36). Eighteen patients had simultaneous cervical and lumbar decompression; five had staged procedures. Perioperative data, complications and functional outcomes were recorded up to one year.

Results: Most patients showed clear, sustained improvement in neurological function and quality of life after surgery. There was no statistically significant difference in the main outcome measures between the staged and simultaneous groups in this series. Younger patients (≤60 years) tended to regain better function and higher SF-36 scores at one year. Serious complications were uncommon; when they occurred they were manageable with standard care.

Conclusion: Both simultaneous and staged decompression provided meaningful benefit when treatments were matched to the patient's condition. The operative approach should be chosen individually, considering symptom dominance, overall fitness and surgical risk.

Keywords: Tandem spinal stenosis, Simultaneous decompression, Staged decompression, JOA score, SF-36, Whole-spine MRI.

Introduction

Tandem spinal stenosis (TSS) denotes the coexistence of spinal canal narrowing at two anatomically separate regions — most commonly the cervical and lumbar spine. Patients with TSS often present with a confusing mixture of lower-extremity symptoms (neurogenic claudication, pain and paresthesia) and upper-motor-neuron signs (hand numbness, weakness, and gait imbalance). This mixed clinical picture may obscure the site primarily responsible for functional impairment, delaying diagnosis and complicating surgical planning. Historically, early clinical series described the natural history and outcomes after decompression in combined cervical and lumbar disease and emphasized the need for careful selection of the dominant symptomatic level when planning surgery [1–4].

Several radiological studies subsequently documented frequent radiographic overlap between cervical and lumbar stenotic


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disease and highlighted that radiological cervical cord compression may be asymptomatic in a substantial proportion of patients presenting with lumbar stenosis; routine whole-spine imaging was advocated in patients with discordant clinical findings [3, 5]. Such observations led to evolving surgical strategies: some authors recommend simultaneous decompression of both regions in selected patients, whereas others favor staged procedures that target the symptom-dominant level first [2, 6]. The choice depends on patient factors (age, comorbidity), the pattern and severity of stenosis on imaging, and the treating team's experience. The remainder of this thesis summarizes clinical presentation, operative choices, outcomes and perioperative safety for patients managed for TSS at our centre.

Review of Literature

Early reports described cases of combined cervical and lumbar stenosis and reported variable outcomes following surgical decompression. Dagi and colleagues documented the natural history and highlighted prognostic indices that influenced recovery after surgery [4]. Kikuike et al. reported favorable mid-term outcomes after one-stage combined cervical and lumbar decompression in selected patients, noting careful patient selection and postoperative rehabilitation were important for patient satisfaction [1]. Eskander and co-workers compared simultaneous and staged decompressions and emphasized the need to weigh operative time and perioperative risks against the benefits of a single hospitalization [2]. Lee and coworkers provided anatomical and radiological insights into TSS that aid interpretation of whole-spine imaging.

Subsequent cohort and population studies refined prevalence estimates and demonstrated that radiographic tandem stenosis is common among older adults and frequently asymptomatic at one region despite significant imaging change at another [5, 7, 8]. The Wakayama population MRI study and similar series documented the prevalence and anatomical characteristics of TSS in a community cohort [9]. Systematic reviews and meta-analyses summarized available observational data and concluded that both staged and simultaneous decompressions can be effective; however, differences in complication rates, operative parameters and recovery patterns depend on whether the pathology involves cervical-lumbar or cervical-thoracic segments [10, 11].

More recent series examined outcomes after selective (target the dominant region) versus nonselective or combined approaches and noted that selective decompression of the symptom-dominant level often achieves comparable functional gains with potentially fewer early complications [12–15]. Studies addressing tandem ossification (OPLL/OLF) and other complex presentations described technical nuances, perioperative risks and the importance of intraoperative neurophysiological monitoring to minimize neurological deterioration [13, 14]. Across the literature the message is consistent: detailed clinical evaluation and whole-spine imaging are essential to tailor the surgical plan for each patient

Methods and Materials

This retrospective analysis included patients with clinical features consistent with TSS and radiological confirmation on whole-spine magnetic resonance imaging or computed tomography. Inclusion required clear documentation of both cervical and lumbar canal compromise and correlation with presenting symptoms and neurological examination. Exclusion criteria included prior multiregional spine surgery that precluded assessment of native anatomy and cases with active infection or neoplasm. Demographic data, comorbid conditions, duration of symptoms, neurological status, and dominant clinical complaints were recorded.

Preoperative assessment included detailed neurological examination, gait and balance assessment, JOA (Japanese Orthopaedic Association) or equivalent functional scores as available, and standardized whole-spine MRI to measure canal dimensions and to grade cord compression. The choice of surgical strategy — simultaneous (one-stage) decompression of both regions versus staged procedures addressing the dominant lesion first — was individualized according to symptom predominance, radiological severity, patient fitness for prolonged anaesthesia and surgeon judgement. Surgical procedures included posterior decompression (laminoplasty or laminectomy), anterior cervical decompression and fusion, and lumbar decompression with or without instrumented fusion when instability or deformity required fixation.

Perioperative data included operative time, blood loss, hospital stay, and complications such as transient neurological deterioration, dural tears, wound infection, or need for reoperation. Patients were followed at routine intervals with clinical and functional scoring at early (6 weeks), intermediate (6–12 months) and longer-term (≥ 24 months when available) time points. Outcomes were compared between groups (simultaneous vs staged; cervical-first vs lumbar-first) with descriptive statistics and where feasible simple comparative tests. Ethical approval and institutional clearances were obtained for retrospective analysis as per the attached thesis document.

Results

The study reviewed 23 patients with tandem spinal stenosis: 21 men and 2 women, aged between 35 and 77 years (mean 67.8 years). Eight patients were 60 or younger, while 15 were older than 60. Eighteen patients had both cervical and lumbar decompression in a single operation and five were treated with staged procedures. Follow-up extended up to twelve months.

Medical problems were common — hypertension affected ten patients and diabetes three — while single cases had prior stroke, ischemic heart disease, rheumatoid arthritis or hypothyroidism; twelve patients reported no major illnesses.

Function and neurological status were tracked with JOA (cervical and lumbar), the European myelopathy score and SF-36 at baseline and at several postoperative time points.

Overall, patients improved after surgery. Measures of pain, function and general health rose steadily from the immediate postoperative period through the 6 and 12-month checks. Improvements in lumbar-related scores were more rapid, while cervical scores tended to climb more gradually. When comparing those who had simultaneous surgery with the staged group, no clear statistical difference appeared in the principal outcome measures within this sample. Younger patients (≤60 years) showed stronger gains in SF-36 domains and overall function at one year. Major Perioperative complications were uncommon, and no new permanent major neurological deficits were observed during follow-up.

Discussion

Tandem spinal stenosis often produces a complex clinical picture because two separate levels can contribute to a patient's symptoms. In practice this means patients commonly present with mixed complaints — walking difficulty or leg pain from lumbar stenosis together with hand numbness, weakness or balance problems from cervical involvement — and teasing apart which level is driving disability can be difficult. That is why whole-spine imaging paired with a careful neurological exam is essential: it helps identify all relevant lesions and prevents treating only part of the problem.

In this series both single-stage and staged surgical strategies delivered meaningful clinical benefit when used for appropriately selected patients. Across the cohort pain, function and quality-of-life scores improved and these gains were generally maintained at one year. The absence of a marked difference between staged and simultaneous approaches in our data suggests that the surgical plan should be guided more by patient factors — physiological reserve, comorbidities and the clinically dominant lesion — than by a rigid preference for one technique. For fit patients with clear multi-level symptoms, a combined procedure can be efficient and spare a second operation; for older or medically complex individuals, staging the surgery reduces immediate physiological stress and remains a sensible option.

Age appeared to influence recovery: patients aged 60 or under tended to regain function and report better quality-of-life scores by one year, likely reflecting greater baseline fitness and fewer competing health problems. Our low observed complication rate is encouraging and likely reflects careful patient selection, thorough preoperative optimization and attentive postoperative care, but surgeons must remain vigilant for issues reported elsewhere, such as transient neurological change, CSF leak or wound complications, and manage them promptly when they occur.

Key limitations of this work include the small cohort size, the imbalance between groups (18 simultaneous vs 5 staged), variable follow-up duration and the mixed retrospective –prospective design. These factors limit statistical power and the ability to generalize the findings widely. Despite these constraints, the consistent trend toward clinical improvement supports the practice of tailoring the operation to the individual patient. Larger, prospective studies with balanced groups and longer follow-up are needed to define more precisely when one strategy is preferable to the other.

Conclusion

In this single-centre cohort, surgical decompression for tandem cervical and lumbar stenosis produced meaningful improvements in neurological function and quality of life. There was no clear superiority of staged versus simultaneous decompression in our sample; instead, outcomes correlated more strongly with patient factors such as age and comorbidity. Younger patients tended to regain better function at one year. Given the small, heterogeneous sample, surgical plans should be individualized: use single-stage combined decompression for physiologically fit patients with concordant symptoms, and prefer staged procedures for older or medically fragile patients who may not tolerate prolonged combined surgery. Thorough whole-spine evaluation and careful perioperative management are essential to achieve good outcomes while minimising risk.

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