What are the indications for 360-degree spinal fixation and anterior reconstruction in pyogenic spinal infections, and does it lead to better outcomes compared to posterior stabilization alone?

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Why is this topic Important

Highlights a key surgical decision in treating pyogenic spinal infections: **360-degree fixation vs. posterior-only** stabilization

Surgical approach **impacts** spinal **stability, neurological recovery**, and **complication rates**

Current evidence is **mixed**, and treatment varies depending on infection severity and anatomical damage

Clearer guidelines and **more research** are needed to optimize outcomes and tailor surgical strategies

Literature Review/Process

Studies Screened	250
Studies assessed for eligibility	160
Studies Excluded	148
Studies included in review	12

Literature Review/Process

S25. What are the indications for 360-degree spinal fixation and anterior reconstruction in pyogenic spinal infections, and does it lead to better outcomes compared to posterior stabilization alone?

REFERENCE & PURPOSE			SUBJECTS			DATA	VARIABLES		CONCLUSION	COMMENTS
Author(s), Title, Journal	Year Published	Purpose	#	Subject Characteristics	Sample Design	Year Data Collected	Control	Intervention		
Nagashima H, Tanishima S, Tanida A. Diagnosis and management of spinal infections. J Orthop Sci. 2018 Jan;23(1):8-13. doi: 10.1016/j.jos.2017.09.016. Epub 2017 Oct 20. PMID: 29066036.	2018	Describe the current viewpoints on the diagnosis and management of spinal infections	Instructional Lecture	Instructional Lecture					M. Tuberculosis treated with anterior instrumentation, debridement and posterior instrumentation. Patients in **poor general condition** two-stage surgical treatment **first posterior instrumentation followed by anterior debridement** and bone grafting	
Wang X, Pang X, Wu P, Luo C, Shen X. One-stage anterior debridement, bone grafting and posterior instrumentation vs. single posterior debridement, bone grafting, and instrumentation for the treatment of thoracic and lumbar spinal tuberculosis. Eur Spine J. 2014 Apr;23(4):830-7. doi: 10.1007/s00586-013-3051-7. Epub 2013 Oct 1. PMID: 24081689; PMCID: PMC3960431.	2013	To compare single posterior debridement, interbody fusion and istrumentation with one-stage anterior fusion and posterior instrumentation for thoracic and lumbar spinal tuberculosis	Anterior approach 55 patients. Posterior approach 60 patients	Thoracic and lumbar spinal tuberculosis	Comparative interventional study.Not randomized. Group A (Anterior approach) 55 patients Group B (Posterior approach) 60 patients	January 2006 to januay 2010	Anterior approach with posterior fixation versus posterior only	Surgical Treatment	The study suggests that **single posterior debridement with bone grafting and instrumentation** is a preferable treatment method for **thoracic and lumbar spinal tuberculosis**, with better outcomes and fewer complications compared to the **anterior and posterior combined approach**. However, anterior intervention might still be necessary in certain cases with abscesses or more complicated infections.	
Aljawadi A, Jahangir N, Jeelani A, Ferguson Z, Niazi N, Arnall F, Pillai A. Management of Pyogenic Spinal Infection, review of literature. J Orthop. 2019 Aug 12;16(6):508-512. doi: 10.1016/j.jor.2019.08.014. PMID: 31680742; PMCID: PMC6818362.	2020	To evaluate the available evidence for the management of Pyogenic Spinal Infection	Literature Review	Review					**Anterior Support** and posterior stabilisation seems to be associated with **increased risk of complicacations. Posterior approach** only may be associated with **fewer complications**	
Nojiri H, Okuda T, Miyagawa K, Kobayashi N, Sato T, Hara T, Ohara Y, Kaneko K. Anterior Spinal Fusion Using Autologous Bone Grafting via the Lateral Approach with Posterior Short-Range Instrumentation for Lumbar Pyogenic Spondylitis with Vertebral Bone Destruction Enables Early Ambulation and Prevents Spinal Deformity. Spine Surg Relat Res. 2020 Jun 18;4(4):320-327. doi: 10.22603/ssrr.2020-0049. PMID: 33195856; PMCID: PMC7661023.	2020	Compare anterior autogenous bone grafting with conservative treatment in patients with pyogenic spondylitis	10 anterior bone grating **group S** vs 10 patients conservative treatment **grupo C**	Pyogenic Spondylitis lumbar spine. Similar baseline characteristics	Comparative, interventional study. Smal sample (10 patients per group)	Not Specified	10 patients conservative management	10 patients MISS lateral approach	The study concludes that the **minimally invasive surgical method** used in the treatment of lumbar pyogenic spondylitis helps in **faster recovery, better pain control, and prevention of spinal deformities** compared to conservative treatment, particularly in patients with significant vertebral bone destruction.	

Literature Review/Process

Ma YZ, Cui X, Li HW, Chen X, Cai XJ, Bai YB. Outcomes of anterior and posterior instrumentation under different surgical procedures for treating thoracic and lumbar spinal tuberculosis in adults. Int Orthop. 2012 Feb;36(2):299-305. doi: 10.1007/s00264-011-1390-8. Epub 2011 Oct 30. PMID: 22042304; PMCID: PMC3282852.	2011	Comparing outcomes between anterior and posterior instrumentation in the management of spinal tuberculosis	Group A (Anterior instrumentation) 74 patients vs Group B (Posterior Instrumentation) 83 patients	Spinal Tuberculosis thoracic or lumbar spine	Retrospective comparative cohort study	January 2004 to December 2009	Clinical Symptoms, kyphosis correction, fusion rates	Anterior instrumentacion vs posterior instrumentation	Both anterior and posterior instrumentation provide effective treatment for spinal TB. However, **posterior instrumentation** might have a slight **advantage** in terms of **correcting deformity and maintaining** that correction.	
Elnady B, Shawky A, Abdelrahman H, Elmorshidy E, El-Meshtawy M, Said GZ. Posterior only approach for fifth lumbar corpectomy: indications and technical notes. Int Orthop. 2017 Dec;41(12):2535-2541. doi: 10.1007/s00264-017-3570-7. Epub 2017 Jul 21. PMID: 28733847.	2017	Evaluate efficacy and safety of posterior-only approach L5 coprectomy for the treatment of infections or bust fractures	17 patients	L5 pathology	Retrospective cohort study	2010 and 2013	Operative times, blood loss, complications and clinical outcomes	L5 corpectomy by posterior-only approach	**Posterior-only approach** is a **safe** and **effective** method for L5 corpectomy, providing benefits like avoiding anterior surgery-related complications while still offering effective stabilization.	
Peeling L, Frangou E, Hentschel S, Gokaslan ZL, Fourney DR. Refinements to the simultaneous anterior-posterior approach to the thoracolumbar spine. J Neurosurg Spine. 2010 May;12(5):456-61. doi: 10.3171/2009.11.SPINE09309. PMID: 20433292.	2010	Describe the simultaneos anterior-posterior approach of the TL spine for oncologial, trauma and infection patients	6 cases	6 cases 3 of them oncologic	Retrospective cohort study	December 2004 to October 2008	ASIA impairment scale, complications	Simultaneos anterior-posterior approach	**Simultaneous, combined approach** has some advantages and appears to be **safe and effective** for selected cases.	
Rayes M, Colen CB, Bahgat DA, Higashida T, Guthikonda M, Rengachary S, Eltahawy HA. Safety of instrumentation in patients with spinal infection. J Neurosurg Spine. 2010 Jun;12(6):647-59. doi: 10.3171/2009.12.SPINE09428. PMID: 20515351.	2010	Report their series cases in which instrumentation was placed in actively infected sites	47 patients. Anterior approach was used in 34 patients	34 patients anterior approach	Retrospective cohort study	2000 - 2006	ASIA impairment scale	Surgical treatment 34 patients anterior approach	**Spinal instrumentation** is **safe** and **beneficial** even in the presence of infection, as long as the infection is properly treated and debrided. **Surgical indication instability** followed by intolerable **back pain** unresponsiveness to antibiotic therapy	
Safran O, Rand N, Kaplan L, Sagiv S, Floman Y. Sequential or simultaneous, same-day anterior decompression and posterior stabilization in the management of vertebral osteomyelitis of the lumbar spine. Spine (Phila Pa 1976). 1998 Sep 1;23(17):1885-90. doi: 10.1097/00007632-199809010-00018. PMID: 9762746.	1998	Evaluate efficacy and clinical outcomes of sequential or simaltaneous anterior and posterior surgical approaches	10 patients. Vertebral osteomyelitis of the lumbar spine	10 patients	Retrospective cohort study	1994 - 1995	Neural deficit, bacteriology	anterior - posterior surgery	**Combined** anterior and posterior surgery is a **safe and efficient way** to **control the infection and stabilize** the affected segments	
Duan D, Cui Y, Gong L, Fan Y, Liu J, Zhou Y, Li W. Single Posterior Surgery Versus Combined Posterior-Anterior Surgery for Lumbar Tuberculosis Patients. Orthop Surg. 2023 Mar;15(3):868-877. doi: 10.1111/os.13628. Epub 2023 Jan 19. PMID: 36655386; PMCID: PMC9977579.	2023	Compare therapeutic efficacy between the single posterior surgery and combined posterior-anterior surgery for lumbar tuberculosis	73 patients posterior only 46 patients posterior anterior surgery	Lumbar tuberculosis	Retrospective cohort study	January 2008 to December 2016	Operation time, blood loss, hospital stay, pail relief, functional improvement, spinopelvic algiment, complications	Posterior only vs posterior anterior surgery	Single **posterior surgery** less invasive but **slower recovery of TB lesions. Combined posterior-anterior surgery faster recovery of abscess and activity** but more invasive. No clear boundary for choosing. Big paravertebral abscess or flow abscess in the anterior side we will choose combined posterior-anterior	

Literature Review/Process

Lin CP, Ma HL, Wang ST, Liu CL, Yu WK, Chang MC. Surgical results of long posterior fixation with short fusion in the treatment of pyogenic spondylodiscitis of the thoracic and lumbar spine: a retrospective study. Spine (Phila Pa 1976). 2012 Dec 1;37(25):E1572-9. doi: 10.1097/BRS.0b013e31827399b8. PMID: 22996263.	2012	Evaluate clinical results of long posterior instrumentation with short fusion without debridement.	48 patients	Pyogenic Spondylodiscitis	Retrospective cohort study	June 1997 to June 2007	Pain improvement, neurological improvement, kyphosis correction , no infection relapse	Long posterior fixation with short fusion	Long **posterior fixation** with short fusion is a feasible and **effective surgical strategy** for treating pyogenic spondylodiscitis of the thoracic and lumbar spine	
Dimar JR, Carreon LY, Glassman SD, Campbell MJ, Hartman MJ, Johnson JR. Treatment of pyogenic vertebral osteomyelitis with anterior debridement and fusion followed by delayed posterior spinal fusion. Spine (Phila Pa 1976). 2004 Feb 1;29(3):326-32; discussion 332. doi: 10.1097/01.brs.0000109410.46538.74. PMID: 14752357.	2004	Evaluate outcomes of treating pyogenic vertebral osteomyelitis	42 patients	Pyogenic Vertebral Osteomyelitis	Cases Series	1990 - 2001	Infection control , neurological recovery, structural supoort	Anterior debridement and fusion followed by delayed instrumented posterior fusion	Anterior debridement and fusion followed by delayed posterior spinal fusion in the treatment of pyogenic vertebral osteomyelitis.**effective infection management**, neurological recovery, and structural support.	Anterior debridement and strut grafting offer initial stability, while delayed posterior fusion enhaces spine stabilization

Findings from Literature

In a comparative study of 55 patients who underwent an anterior approach followed by posterior fixation versus 60 patients who received posterior fixation only, Wang et al. (2) found that the anterior intervention might still be necessary in cases with abscesses or more complicated infections. However, the posterior-only approach resulted in better outcomes and fewer complications. Similarly, in 2023, Duan et al. (10) compared the therapeutic efficacy of single posterior surgery (73 patients) and combined posterior-anterior surgery (46 patients) for lumbar tuberculosis. They concluded that while single posterior surgery is less invasive, it showed a slower rate of recovery of TB lesions. In contrast, the combined posterior-anterior surgery led to a faster recovery of abscesses and TB activity but was a more invasive procedure. The authors recommend using the anterior approach when there are large paravertebral abscesses or fluid abscesses on the anterior side.

Findings from Literature

Safran et al. (9) evaluated the efficacy and clinical outcomes of sequential or simultaneous anterior and posterior surgical approaches. The study found that while both approaches were effective, the combined anterior-posterior approach provided better correction of kyphotic deformity, particularly in the thoracolumbar and lumbar regions. Dimar et al., in a case series of 42 patients who received anterior debridement and fusion followed by delayed instrumented posterior fusion, reported effective infection management, neurological recovery, and structural support. The authors concluded that anterior debridement and strut grafting provide initial stability, while delayed posterior fusion enhances spinal stabilization.

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Question:

What are the indications for 360-degree spinal fixation and anterior reconstruction in pyogenic spinal infections, and does it lead to better outcomes compared to posterior stabilization alone?

Response:

Anterior reconstruction is indicated when there **is severe anterior destruction, instability**, **kyphotic deformity**, **abscess formation**, or **neurological compromise**. However, there is **conflicting evidence** regarding which technique leads to better outcomes.

❖ Vote:

Agree – 83.8%, Disagree – 0%, Abstain – 16.2%
(Strong Consensus)