

Case Report



Vertebral Osteomyelitis Following Vertebroplasty: Is Acne a Potential Contraindication and Are Prophylactic Antibiotics Mandatory Prior to Vertebroplasty?

Mubin I. Syed, MD^{1,2}, Bindu Avutu, MD, MPH², Azim Shaikh, MD, MBA¹,
Hannah Sparks, BS, RT, MBA¹, Mutahher Ibarze Mohammed, BS¹, and Kamal Morar, MD¹

From: ¹Dayton Interventional Radiology, Dayton, OH; and
²Wright State University, School of Medicine, Dayton, OH.

Address correspondence:
Mubin I. Syed, MD
Dayton Interventional Radiology
3075 Governors Place Blvd
Suite 120
Dayton, OH 45409
E-mail: mubinsyed@aol.com

Disclaimer: There was no external funding in the preparation of this manuscript.
Conflict of interest: None.

Manuscript received:
12/01/2008

Revised manuscript received:
01/05/2009

Accepted for publication:
03/03/2009

Free full manuscript:
www.painphysicianjournal.com

We present a case of vertebral osteomyelitis following vertebroplasty in a patient with acne of the back. Vertebral biopsy revealed *Corynebacterium* species and blood cultures were positive for *Propionibacterium* species.

The patient did not respond to long-term intravenous antibiotics and required vertebral corpectomy and debridement with instrumentation. Interventionalists should be able to recognize acne of the back and consider this as a potential contraindication to vertebroplasty.

Prophylactic antibiotics should be considered in all patients prior to vertebroplasty since subepidermal organisms are not eliminated with the standard skin prep.

Key words: Vertebroplasty, complication, vertebral osteomyelitis, acne

Pain Physician 2009; 12:E285-E290

Vertebroplasty has become a well established treatment for compression fractures of the lumbar and thoracic spine with over 90% of patients reporting immediate relief of pain (1). All recent studies done on vertebroplasty have demonstrated about 1 – 3% rates of minor adverse events and no severe complications that would require surgical intervention (2). In Nussbaum et al (2), all the complications from 1999 to 2003 due to transpedicular vertebroplasty were recorded from the 130,000 to 160,000 performed. Three complications were due to allergic reactions secondary to PMMA,

and 2 were from the extravasation of the cement. Post vertebroplasty infections are quite rare, and the literature reports only 12 known cases (3-12). We report a case of osteomyelitis and abscess formation following vertebroplasty caused by the common skin anaerobe, *Propionibacterium* and/or *Corynebacterium* in a patient with acne.

CASE REPORT

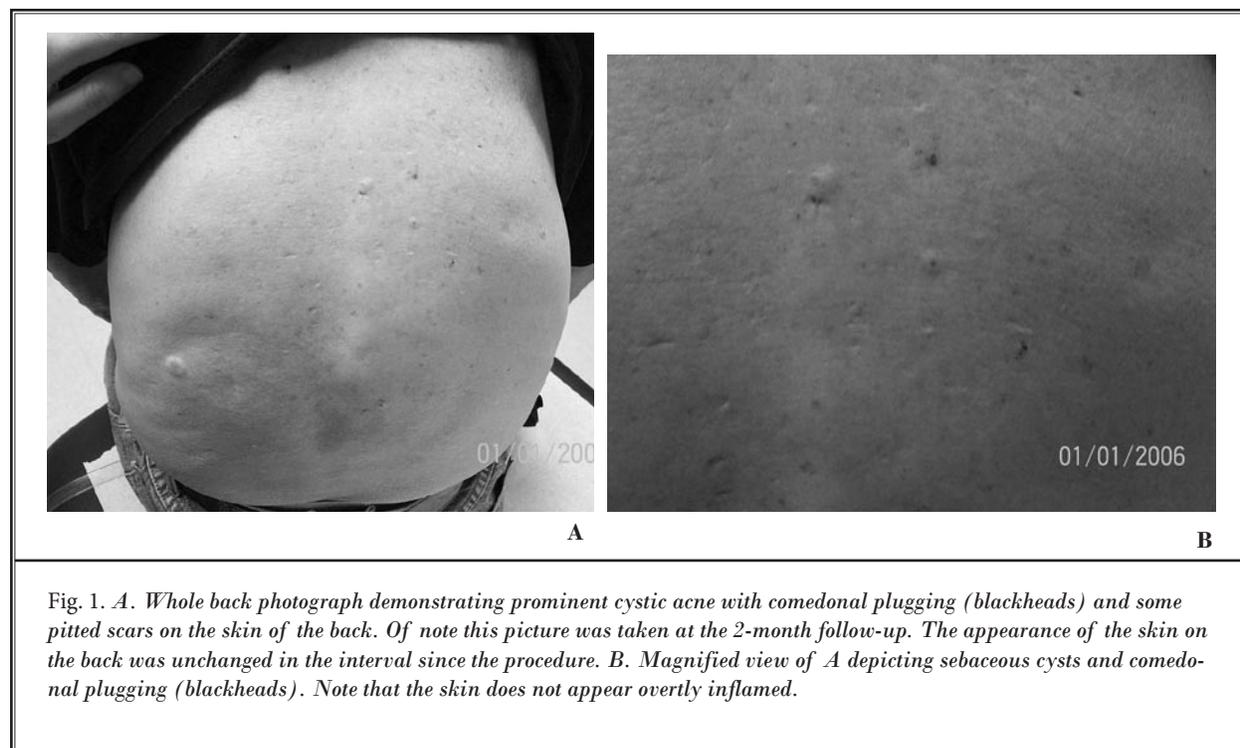
This is a case of a 56-year-old Caucasian male with a past medical history of vitamin D deficiency on treatment with vitamin D, calcium, and alendro-

nate. He presented initially following a fall. It was also noted that the patient had prominent cystic acne with comedonal plugging (blackheads) and some pitted scars on the skin of the back (Fig. 1a and 1b). His initial MRI confirmed a subacute compression fracture of the T12 vertebrae with marrow edema. He subsequently underwent vertebroplasty of T12 utilizing 2 mL of methylmethacrylate. He continued to have pain, but the MRI was nonrevealing. It was hypothesized that the persistent pain was due to insufficient cement filling on the left side from the first procedure. Subsequently he underwent a repeat vertebroplasty using an estimated 1–2 mL of methylmethacrylate on the left side of T12 without complication. He still continued to have pain and MRI demonstrated a new fracture of T11.

The patient was then referred to our practice. Following this he underwent a vertebroplasty of T11 using 4.0 mL of methylmethacrylate without complication and adequate pain control. Two months later due to recurrent pain a repeat MRI was performed which revealed a new endplate vertebral body compression fracture of the T10 vertebrae. Due to his recurrent fractures he was referred to rheumatology for

aggressive treatment and workup of his osteoporosis and to determine an underlying cause for his vitamin D deficiency. It was noted he had no history of alcoholism, but had a 40-pack a year history of smoking as predisposing factors for osteoporosis. He then underwent successful vertebroplasty of his T10 vertebrae with a simultaneous vertebral body biopsy 2 weeks later. The biopsy was negative for osteomyelitis or any pathology.

Throughout the subsequent week following the procedure the patient presents again reporting sharp pain in the lumbar region. This pain was felt to be post-procedure pain and was treated with Percocet and arrangements were made for the patient to see a medical pain management specialist. He presented to the emergency room one week later with a temperature of 101.6 degrees, ESR 125, and a WBC of 10.9. He had paravertebral tenderness in the thoracolumbar spine, and severely limited range of motion of the lower extremities. An MRI (Fig. 2a and 2b) demonstrated T1 images post gadolinium with a hyperintense heterogeneous soft tissue region along the paraspinal region of T10 to T12. There was also a 9mm cystic appearing structure along the paraspinal region of T10-T12 with



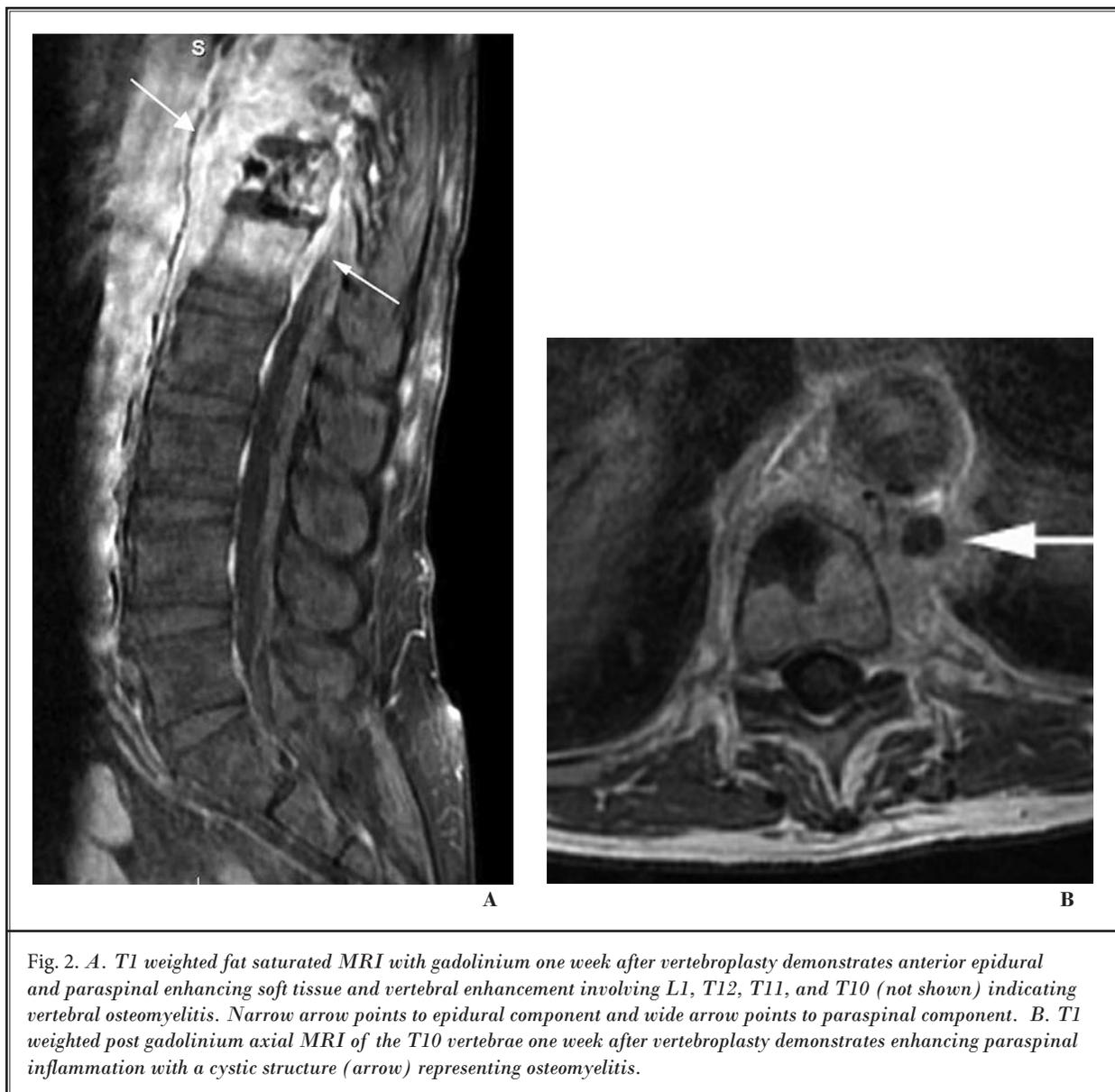


Fig. 2. A. T1 weighted fat saturated MRI with gadolinium one week after vertebroplasty demonstrates anterior epidural and paraspinal enhancing soft tissue and vertebral enhancement involving L1, T12, T11, and T10 (not shown) indicating vertebral osteomyelitis. Narrow arrow points to epidural component and wide arrow points to paraspinal component. B. T1 weighted post gadolinium axial MRI of the T10 vertebrae one week after vertebroplasty demonstrates enhancing paraspinal inflammation with a cystic structure (arrow) representing osteomyelitis.

a focal increased T2 signal surrounded by nonenhancement. Also, mild increased T2 signal was shown within the L1 vertebral body suggesting marrow edema.

The patient was started on vancomycin 900 mg IV daily for the suspected osteomyelitis and abscess, and a CT guided aspiration of the fluid was then performed. Cultures of yellow, thick purulent material from the abscess were positive for *Corynebacterium* and blood culture was positive for *Propionibacterium* species. He was continued on IV vancomycin and ceftriaxone 2g daily was added. He was discharged 2 weeks

later with a 6-week course of antibiotics. On follow-up, after the patient had completed his antibiotics, he was still complaining of intractable pain. MRI was performed and showed new increased T2 signal within the L1 vertebral body suggesting marrow edema. Also, the previous abscess was still present; however, it was smaller than in the previous study with no rim enhancement identified. Due to these findings it was recommended to try an additional month of IV antibiotic therapy. However, despite these measures the patient still had intractable severe back pain. It was

noted on repeat MRI that there was progression of the vertebral osteomyelitis with slightly increased kyphosis and mildly increased vertebral body collapse at T11 and T12. Therefore, orthopedic spine surgery was consulted and the patient underwent a thoracotomy with T10, T11, and T12 corpectomy and debridement. He also underwent interbody fusion from T10 through L1 with fibular strut grafts and posterior lateral fusion from T5 through L3 with instrumentation. Cultures taken during surgery were negative.

Discussion

Vertebroplasty is a safe, commonly used treatment for patients with osteoporotic compression fractures of the thoracic and lumbar spine. Immediate pain relief has been noted in the majority of patients. Complications are rare following vertebroplasty, and most cases are due to secondary leakage of the PMMA cement or allergic reactions to the cement (2). Infection rates are even lower, and most cases of post-vertebroplasty infections are identified with low virulence organisms such as coagulase negative *Staphylococcus*, *Staphylococcus epidermis*, *Acinetobacter* species, or in some cases no organism can be identified (7,11). Recent infections or surgery have been associated with osteomyelitis following vertebroplasty, and one such case was in a patient with a history of recent urinary tract infection with *Enterobacter* species and another patient had recently undergone several discectomies (4). Also, previous cases were identified in patients who were immunocompromised with prolonged steroid use or diabetes mellitus (7). It has been well established that patients undergoing vertebroplasty that are at higher risk for infection include those with recent infection, immunocompromised state, or recent surgical interventions. Also one case specifically describes a patient with epidural abscess formation following vertebroplasty with *Staphylococcus aureus* bacteria with no predisposing conditions (13). The patient described in our case had been identified as having untreated nodulocystic acne involving the back region which was the predisposing factor for the osteomyelitis and abscess formation.

Corynebacterium is a Gram positive, aerobic or facultatively anaerobic, diptheroid bacterium considered part of the normal flora of the skin and mucous membranes. It is implicated in lesser conditions such as acne (14,15). *Corynebacterium* is thought to be an organism with low virulence. However, it has

been implicated as a pathogen in man. Specifically, it is responsible for about 1% of all cases of vertebral osteomyelitis not related to an open spinal procedure (12,16-18).

Propionibacterium species are common Gram positive anaerobic flora found on the skin of which *Propionibacterium acnes* (*P. acnes*) is the most virulent. *P. acnes* was formerly known as *Corynebacterium parvum*. *P. acnes* may be associated with a clinical picture of acne or psoriasis. *P. acnes* is well described in the dermatologic literature and is probably the dominant bacterium of sebaceous areas and hair follicles (7). During the typical skin preparation (chlorhexidine or betadine) for sterile procedures this organism may not be eradicated due to its subepidermal location especially in patients with acne. In the surgical literature use of a second scalpel has been advocated after skin incision to prevent contamination from subepidermal organisms such as *P. acnes* (19).

P. acnes is typically a non-invasive pathogen of low virulence, however there have been several cases of reported postoperative infections following placement of heart valves, orthopedic prostheses, vascular grafts, and ventricular shunts (20). Several reports have also identified post craniotomy infections with *P. acnes*. Recently, Stirling et al (21) have proposed that *P. acnes* could be associated with sciatica. They suggest that if there is a minor trauma of some sort in the spinal disc, this would allow the low virulent anaerobes to stimulate a chronic inflammatory response. Noble et al (22) first described a case of osteomyelitis potentially linked to *P. acnes* to bone infections following discectomy. More recently, several cases of discitis caused by *P. acnes* following discectomy have been reported. It is noted that vertebral osteomyelitis due to *P. acnes* has even been reported spontaneously in a patient with nodular cystic acne osteomyelitis with no prior surgery (23). Three percent of all cases of bacterial spondylodiscitis are anaerobic in nature with *P. acnes* being the second most common organism reported (12).

The symptoms in these cases are typically associated with back pain and radiculopathy, low grade fevers, and point tenderness. The usual infection that occurs postoperatively takes a couple of weeks to several months to present because of its low virulence, and is also seen with increased erythrocyte sedimentation rates (ESR). In one case of postoperative osteomyelitis secondary to *P. acnes* the patient had a predisposing condition of psoriasis and subsequently the infection

did not respond to antibiotics alone, eventually requiring surgical intervention (24). The predisposing factor of cystic acne as in our patient has not been previously described as a possible risk factor for post vertebroplasty infections.

Suggested regimens of prophylactic intraprocedural intravenous antibiotics include first line use of cefazolin 1gm, and second line (penicillin allergy) use of clindamycin 600mg, vancomycin 1gm or clindamycin 600mg and vancomycin 1gm (25). Routine parenteral antibiotic prophylaxis prior to vertebroplasty has little data to support or oppose its administration (23). Since this patient was not immunocompromised, prophylactic antibiotics were not given. Quality assurance guidelines for percutaneous vertebroplasty from the Cardiovascular and Interventional Radiological Society of Europe (CIRSE) state that intraprocedural antibiotic coverage is mandatory in immunocompromised patients; however at present in other patient groups, there is no clear consensus (27). The overall rate of infection is very low, and Yu et al (6) reported that with the use of prophylactic antibiotics their infection rate was lower than 0.5%. Others have experienced vertebroplasty related infections even with parenteral preoperative antibiotics (3,5,8,28). In our case it likely would have been difficult to eradicate acne related subcutaneous organisms with a single dose of antibiotic. However, it can be argued that preoperative antibiotics may have been helpful in preventing infection in our case. It is to be noted that infections with *P. acnes* can occur in the setting of neurosurgery even with the use of prophylactic intravenous cefazolin (31).

Another area of debate is the use of antibiotics mixed into the methylmethacrylate. Many authors have concluded that the routine mixing of cement with antibiotics is not necessary (6,25). Antibiotic loaded bone cements have become common use in the prevention and the treatment of prosthesis-related infections for orthopedic related surgeries. For vertebroplasty, antibiotic additives with bone cements are currently restricted to high-risk groups (7,30).

P. acnes in the post-neurosurgical infection setting has been effectively treated with high dose penicillin. *P. acnes* has also been shown to be susceptible in the post-neurosurgical setting to high doses of clindamycin or cephalosporins approximately 87% of the time

(29). Most patients with *P. acnes* and *Corynebacterium* vertebral osteomyelitis have been treated successfully with antimicrobial therapy alone. Vancomycin is also effective against gram positive organisms such as *P. acnes* and *Corynebacterium*. This includes osteomyelitis occurring spontaneously or in the setting of spinal surgery without implants. The presence of any foreign material however increases the likelihood of treatment failure for *P. acnes* spinal infection (31). Our patient was treated with vancomycin and ceftriaxone. Unfortunately the osteomyelitis and abscess persisted probably due to the presence of foreign material (methylmethacrylate). Therefore, subsequent surgical intervention was needed.

It is realized that both *Corynebacterium* and *Propionibacterium* are known common contaminants of any culture since they are common skin organisms. In spite of this, the literature suggests that they are significant pathogens in vertebral osteomyelitis. We understand that identification of the actual causative organism is a weakness of this paper. However, it is indisputable that this patient had vertebral osteomyelitis following vertebroplasty and had prominent cystic acne with comedonal plugging which are known to contain the above mentioned organisms. Therefore, the identity of the causative organism is not as relevant. Rather, much more relevant is the potential predisposing factor of acne as the cause of osteomyelitis following vertebroplasty.

CONCLUSION

Our case correlates the common skin condition, acne, as a potential predisposing factor to infection following vertebroplasty. This case implicates the common skin flora *Corynebacterium* and/or *Propionibacterium* as possible causative agents which could lead to osteomyelitis and abscess formation. This infection can be difficult to treat in the presence of methylmethacrylate. We therefore, strongly advocate intravenous antibiotics prior to vertebroplasty due to these above mentioned subepidermal organisms. Caution should be utilized in patients with acne involving the back region who will undergo vertebroplasty due to the risk of subsequent infection. The interventionalist should have an appreciation of the appearance of cystic acne prior to considering vertebroplasty, even if prophylactic antibiotics are administered.

REFERENCES

- Evans A, Jensen M, Kip K. Vertebral compression fractures: Pain reduction and improvement in functional mobility after percutaneous polymethylmethacrylate vertebroplasty retrospective report of 245 cases. *Radiology* 2003; 226:366-372.
- Nussbaum D, Gailloud P, Murphy K. A review of complications associated with vertebroplasty and kyphoplasty as reported to the Food and Drug Administration medical device related web site. *Journal of Vascular and Interventional Radiology (JVIR)* 2004; 15:1185-1192.
- Söyüncü Y, Ozdemir H, Söyüncü S, Bigat Z, Gür S. Posterior spinal epidural abscess: An unusual complication of vertebroplasty. *Joint Bone Spine* 2006; 73:753-755. Epub 2006 Apr 25.
- Mummaneni PV, Walker DH, Mizuno J, Rodts GE. Infected vertebroplasty requiring 360 degrees spinal reconstruction: Long-term follow-up review. Report of two cases. *J Neurosurg Spine* 2006; 5:86-89.
- Olmos A, Gonzalez S, Clemente D. Infected vertebroplasty due to uncommon bacteria solved surgically: A rare and threatening life complication of a common procedure. *Spine* 2006; 31:770-773.
- Yu S, Chen W, Lin W. Serious pyogenic spondylitis following vertebroplasty: A case report. *Spine* 2004;29:209-211.
- Lin W, Lee C, Chen S, Lui C. Unusual presentation of infected vertebroplasty with delayed cement dislodgment in an immunocompromised patient: Case report and review of literature. *Cardiovascular Interventional Radiology* 2008; 31:231-235.
- Vats HS, McKiernan FE. Infected vertebroplasty: Case report and review of literature. *Spine* 2006; 31:E859-862.
- Walker DH, Mummaneni P, Rodts GE Jr. Infected vertebroplasty. Report of two cases and review of the literature. *Neurosurg Focus* 2004; 17:E6.
- Deramond H, Depriester C, Galibert P, Le Gars D. Percutaneous vertebroplasty with polymethylmethacrylate: Technique, indications and results. *Radiol Clin North Am* 1998; 36:533-546.
- Schmid KE, Boszczyk BM, Bierschneider M, Zarfl A, Robert B, Jaksche H. Spondylitis following vertebroplasty: A case report. *Eur Spine J* 2005; 14:895-899.
- Saeed MU, Mariani P, Martin C, Smego RA Jr, Potti A, Tight R, Thiede D. Anaerobic spondylodiscitis: Case series and systematic review. *South Med J* 2005; 98:144-148.
- Soyuncu Y, Ozdemir H, Soyuncu S, Bigat Z, Gur S. Posterior spinal epidural abscess: An unusual complication of vertebroplasty. *Joint Bone Spine* 2006; 73:753-755.
- Shehadeh NH, Kligman AM. The bacteriology of acne. *Arch Dermatol* 1963; 88:829-831.
- Kirschbaum JO, Kligman AM. The pathogenic role of *Corynebacterium acnes* in acne vulgaris. *Arch Dermatol* 1963; 88:832-833.
- Ceilley RI. Foot ulceration and vertebral osteomyelitis with *Corynebacterium haemolyticum*. *Arch Dermatol* 1977; 113:646-647.
- Fernández-Ayala M, Nan DN, Fariñas MC. Vertebral osteomyelitis due to *Corynebacterium striatum*. *Am J Med* 2001; 111:167.
- Carragee EJ. Pyogenic vertebral osteomyelitis. *J Bone Joint Surg Am* 1997; 79:874-880.
- Schindler OS, Spencer RF, Smith MD. Should we use a separate knife for the skin? *J Bone Joint Surg Br* 2006; 88:382-385.
- Collignon P, Munro R, Sorrell T. Propionibacterium acnes infection in neurosurgical patients. *Medical Journal of Australia* 1986; 145:408-410.
- Stirling A, Worthington T, Rafiq M, Lambert P. Association between sciatica and Propionibacterium acnes. *Lancet* 2001; 357:2024-2025.
- Noble R, Overman S. Propionibacterium acnes Osteomyelitis: Case report and review of the literature. *Journal of Clinical Microbiology* 1987; 25:251-254.
- Do TT, Strub WM, Witte D. Subacute Propionibacterium acnes osteomyelitis of the spine in an adolescent. *J Pediatr Orthop B* 2003; 12:284-287.
- Harris A, Hennicke C, Byers K, Welch W. Postoperative discitis due to Propionibacterium acnes. *Surgical Neurology* 2005; 63:538-541.
- Mathis JM. Percutaneous vertebroplasty: Complication avoidance and technique optimization. *AJNR Am J Neuroradiol* 2003; 24:1697-1706.
- Eskey CJ, Hirsch J, Manchikanti L. Vertebroplasty and Kyphoplasty. In: *Interventional Techniques in Chronic Spinal Pain*. Manchikanti L, Singh V (eds). ASIPP Publishing, Paducah, KY: 2007; p 641.
- Gangi A, Sabharwal T, Irani FG, Buy X, Morales JP, Adam A. Standards of Practice Committee of the Society of Interventional Radiology. Quality assurance guidelines for percutaneous vertebroplasty. *Cardiovasc Intervent Radiol* 2006; 29:173-178.
- Walker DH, Mummaneni P, Rodts GE Jr. Infected vertebroplasty. Report of two cases and review of the literature. *Neurosurg Focus* 2004; 17:E6.
- Nisbet M, Briggs S, Ellis-Pegler R, Thomas M, Holland D. Propionibacterium acnes: An under-appreciated cause of post-neurosurgical infection. *J Antimicrob Chemother* 2007; 60:1097-1103. Epub 2007 Sep 17.
- Hernandez H, Muñoz E, Goñi I, Gurruchaga M. New injectable and radiopaque antibiotic loaded acrylic bone cements. *J Biomed Mater Res B Appl Biomater* 2008; 87:312-320.
- Kowalski TJ, Berbari EF, Huddleston PM, Steckelberg JM, Osmon DR. Propionibacterium acnes vertebral osteomyelitis: Seek and ye shall find? *Clin Orthop Relat Res* 2007; 461:25-30.