

Cost-effectiveness of Early Surgical Intervention in Silent Osteolysis

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Abstract: Access to subspecialty care is the subject of significant controversy. Most managed-care systems closely monitor the number of specialist referrals as well as x-rays ordered for patients with no symptoms, but large lytic lesions can exist around implants without any pain. Intervention costs were calculated for 2 groups of patients: 1 group with silent lysis with no symptoms and another group with periprosthetic fractures around lytic lesions. The costs were significantly higher in the group in which the fractures occurred versus the group in which early intervention was performed. Early diagnosis of structurally critical lytic lesions around implants by routine follow-up monitoring is recommended for all joint replacement patients. **Key words:** cost-effectiveness, osteolysis, managed care, x-rays, asymptomatic follow-up visits.

Access to subspecialty care is the subject of significant controversy in the healthcare debate [1–3]. Most managed-care systems closely monitor the number of specialist referrals by primary-care doctors. These primary-care physicians, or gatekeepers, are evaluated on their “utilization” patterns, including use of x-rays and laboratory studies as well as subspecialty referrals. Referral to a surgical specialist is costly and therefore undesirable for primary-care physicians. In most managed-care systems, these gatekeepers are closely monitored and financially penalized for “excess” use of studies and referrals to surgical subspecialists [4–6].

Currently, most primary-care physicians refer patients to surgical subspecialists only in the presence of severe pain and/or loss of function. Referral of a patient with a painless, fully functional total hip arthroplasty (THA) to an orthopaedic surgeon could appear to be wasteful. Within a 6-month period, managed-care systems in Miami, Florida, have de-

nied approval on at least 5 occasions for x-rays that I have ordered for painless THAs. On occasion, these gatekeepers demand literature to justify the costs of an x-ray or referral to an orthopaedic surgeon. This literature, as of 1995, is scarce and difficult to find.

It is general knowledge in the joint-replacement field that periprosthetic osteolysis is occasionally accompanied by little pain and minimal loss of function [7]. These lytic lesions in bone around THAs can be structurally devastating yet have little effect on patients’ perceived quality of life. In some cases, the physical examination findings and the clinical pain level are normal and there is no loss of function. This “silent” osteolysis is present in a small but clinically significant population of patients.

Relatively rigorous guidelines exist for early surgical intervention in lytic lesions in tumor cases [8]. Although little basic scientific work has been published on the subject in the joint-replacement literature, most arthroplasty surgeons agree that when the structural integrity of an arthroplastic reconstruction is compromised by a large lytic lesion around the implant, surgical intervention is imperative even if there is minimal pain and no loss of function [7].

Several studies have been published on the economics of joint replacement [9–12]. My objective in

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this study was to assess the cost-effectiveness of early surgical intervention in structurally critical lesions around THAs.

Materials and Methods

A prospective cost-effectiveness study of all arthroplasty patients is currently underway at the University of Miami School of Medicine. In this study, all arthroplasty patients undergo a complete evaluation prior to surgical intervention. To quantitate their pain, all patients fill out a pain diagram similar to those used in spinal surgery but limited to the lower extremity. The diagram is accompanied by 5 questions relating to the nature of the pain.

Intervention costs are calculated for every procedure. Detailed charges, as well as cost-to-charge ratios, are provided by the hospital's chief financial officer. Costs are then calculated by multiplying the charges by the cost-to-charge ratio.

The database was queried for periprosthetic fractures associated with little trauma and for all hip revision cases. Three patients were identified with periprosthetic fractures around large osteolytic defects around the socket or the shaft. These patients, in my opinion, had fractures that were the result of progressing lytic lesions. An additional 4 patients were identified who underwent THA revision and had large, structurally compromising periprosthetic lytic lesions suggesting an impending fracture. In all cases, there were radiographic signs of impending fracture.

Surgical intervention was performed in both groups. I performed all the surgical procedures at Cedars Medical Center and followed the University of Miami joint-replacement protocol. This protocol includes perioperative antibiotics for 72 hours in all revision cases, as well as oral Coumadin and mechanical prophylaxis for deep vein thrombosis.

A 2-tailed Student's *t*-test was used to compare the groups and a *P* value of less than .05 was considered significant.

Results

A total of 8 patients were identified who matched the selection criteria. Four were found in the periprosthetic fracture group and 4 in the early intervention group.

Average cost per patient in the group with periprosthetic fractures prior to surgical intervention was \$24,367. Average cost per patient in the group that underwent early surgical intervention was \$13,684. Length of stay in the early intervention group was 6.75 days, compared to 12.75 days

for the periprosthetic fracture group. A 2-tailed *t*-test with unequal variances demonstrated statistically significant differences between the 2 groups ($P < .01$). The pain diagrams, Mayo Clinic and modified Harris scores, and the standard orthopaedic scores in the early intervention group were nearly normal prior to the surgical procedure.

Discussion

Although this study included a very small number of patients, periprosthetic osteolytic lesions are a growing problem. In a small but select group of patients, these lytic lesions are painless. In the face of heavy penetration by managed-care systems, access to specialists for these patients could be denied by gatekeepers. In a patient with a structurally critical periprosthetic lytic lesion, early intervention at a relatively asymptomatic stage can be extremely cost-effective. It could be argued that the savings in dollars produced by early surgical intervention in cases like the ones discussed here could perhaps justify every-other-year surveillance of all THA patients. Although larger prospective studies should be performed to definitively answer this important question, the data presented here suggest the cost-effectiveness of surgical intervention in a patient population that has impending fractures with little or no pain [13].

From a patient viewpoint, an elective procedure (early intervention) allows for autologous blood donation and support-system planning. In addition, nutrition profiles can be assessed and preoperative studies can be performed on a nonemergency basis. Overall, the patient can be better prepared for the surgical intervention. Avoidance of the pain produced by a periprosthetic fracture is also an important factor.

From the surgeon's standpoint, the prosthetic device used in most difficult cases can be selected and special-ordered, if needed. In addition, the case can be placed on the elective schedule with the surgical team of choice.

In a recent article, it was suggested that perhaps some of these osteolytic lesions will regress with the use of pharmacologic agents and pulse electromagnetic fields [14]. The effectiveness of this approach is questionable in large lesions; however, even if this nonsurgical intervention were to become an accepted modality, the patients for whom it is feasible would need to be identified and the cost-effectiveness of the intervention would need to be demonstrated.

Patient-oriented outcome measures and pain scores in patients with periprosthetic lytic lesions will be completely normal before the surgical intervention. In light of the complicated nature of these prophylactic procedures, however, it is possible that early intervention will affect the patient-perceived outcome negatively. It is extremely important that the clinician-oriented outcome be clearly documented and correlated with the patient-perceived outcome. These correlations should be reported in the literature so that economic rationing of early surgical intervention in patients with large lytic lesions and little pain can be avoided.

Conclusion

Although this is not a prospective randomized study and is not intended to resolve the issue of surgical intervention, the data presented here demonstrate the importance of yearly or every-other-year x-ray surveillance of arthroplasty patients. The cost savings seen in the early intervention group reported here can be shown to insurance executives making the economic decisions in large managed-care systems as demonstration of the beneficial economic effects of appropriate subspecialty referral and x-rays every other year for THA patients.

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