Surgical infections

To The Editor: We have read with interest the retrospective case series by Gruskay et al., evaluating the hypothesized relation between seasonal factors and the occurrence of surgical site infections (SSIs) following spinal surgery (Gruskay J, Smith J, Kepler CK, et al: The seasonality of postoperative infection in spine surgery. Clinical article. J Neurosurg Spine 18:57–62, January 2013). The authors found a significantly higher rate of SSIs during the summer and fall months and considered the postulated hypothesis as being correct. We believe, however, that the reported conclusion should be interpreted with caution.

First, we would like to comment on the month-by-month analysis. The authors found a significant correlation between the dates when surgeries took place and the occurrence of SSIs. The beginning of the academic year (July) was considered as a starting point for the trend analysis. However, the authors also discussed that program residents rotate every 2 months and the fellowship program starts in August. This undermines the rationale of assessing trends for the “academic year.” A more convincing starting point would thus have been June, the start of summer in the northern hemisphere. Based on the data presented in the authors’ report, we reconstructed Fig. 3 in the original report, here Fig. 1 upper, and performed a re-analysis with June as a starting point (Fig. 1 lower). By applying a seasonal rather than an academic starting point, the correlation lost its statistical significance. This alternative approach clearly demonstrates the limitation and weakness of the applied correlation statistics.

Finally, but most importantly, the authors did not consider the role of confounding factors in their analysis. In a recently published systematic review, we demonstrated that over 73 factors have previously been evaluated for the risk of an SSI after spinal surgery. Gruskay et al. considered only one factor, seasonality, leaving frequently cited risk factors, including diabetes mellitus and obesity, but also presented “duration of surgery” data out of the statistical model. Although Gruskay et al. succeeded in raising awareness of the potential existence of seasonal related risk factors for SSIs following spinal surgery—which indeed merits consideration in future studies—we believe the validity of presented findings and correlations are limited.

AlberT F. Pull Ter Gunne, M.D., Ph.D.
Cees J. H. M. van Laarhoven, M.D., Ph.D., Prof.
Allard J. F. Hosman, M.D., Ph.D.
Radboud University Nijmegen Medical Center
Nijmegen, The Netherlands
Stoke Mandeville Spinal Foundation
National Spinal Injuries Centre
Stoke Mandeville Hospital
Aylesbury, United Kingdom
Harris Manchester College
University of Oxford
Oxford, United Kingdom

Disclosure

The authors report no conflict of interest.

References


RESPONSE: We appreciate the comments made by Dr. Pull ter Gunne and colleagues regarding our study.

The purpose of the study was to assess the seasonal variation of infection following spine surgery. The choice of July as the “start” of our summer and year was a decision based on several factors. First, it is the beginning...
of our academic year and thus the time point when the housestaff are least experienced. Second, while we are not sure of the weather patterns at Dr. Pull ter Gunne’s institution, July marks the beginning of the hottest 3-month stretch in our city, as well as the month beginning closest to the summer solstice on June 21st. Finally, convention established in previously published papers regarding this topic placed July as the starting point of the summer.1–3

In our analysis we emphasized in the limitations paragraph of the manuscript our failure to include all confounding factors as a shortcoming due to the methodology of the paper. It is true that a number of both patient and environmental factors play a role in postoperative infection risk. While including confounding data would have been ideal, due to the retrospective de-identified nature of our data set, this was not possible. A major benefit, however, to the study was the use of a database containing over 8000 cases at a single institution. We believe the power afforded by our sample size, especially for a rare complication such as infection, outweighs the obvious limitations imposed by such a database. Even so, we find it unlikely that the elective nature of our patient or case type on average would significantly differ between seasons. Efforts were made using the information available to make this point—for instance, trauma and idiopathic scoliosis cases showed no significant difference in case type between seasons.

In the end, we agree with Dr. Pull ter Gunne et al. regarding the potential effects of confounding factors. Future prospective studies should be conducted with these in mind to provide clearer answers as to the risk factors for postoperative spine infections so as to minimize their unfortunate occurrence.

References


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Kyphoplasty using bone cement mixed with 153Sm-EDTMP

TO THE EDITOR: It has been proposed that samarium-153-ethylenediaminetetramethylene phosphonic acid (153Sm-EDTMP) mixed with bone cement could prevent local tumor regrowth by irradiation of the rest tumor tissue after kyphoplasty. Analysis of physical and chemical properties of 153Sm-EDTMP and the cement makes it rather implausible. The authors2 describe a method of therapy for metastases in vertebral bodies by kyphoplasty performed using bone cement mixed with 153Sm-EDTMP (Cardoso ER, Ashamalla H, Weng L, et al: Percutaneous tumor curettage and interstitial delivery of samarium-153 coupled with kyphoplasty for treatment of vertebral metastases. Technical note. J Neurosurg Spine 10:336–342, April 2009). The same authors describe their method also in other papers,1 and an animal model of this procedure is known as well.3

Samarium-153 is a radionuclide with a physical half-life of 46.28 hours. It emits beta-minus radiation with several end energies (most abundant: 704, 634, and 807 keV); the mean kinetic energy of the emitted electron equals 224 keV per one radioactive disintegration. The mean range of the beta rays accounts for approximately 1 mm in water (soft tissue), and is shorter in bone. All the particles are absorbed within the range of less than 3 mm in soft tissue. The nuclide is also a source of gamma rays; the energy of the most abundant (29.25%) photons is 103 keV. The absorbed dose constant of samarium-153 for gamma radiation is 16.2 μSv · m2 · GBq⁻¹ · h⁻¹.

The main ingredient of the bone cement is methyl methacrylate, the chemical structure of which is H₂C=C(CH₃)-COO-CH₃. This is a liquid substance, slightly soluble in water. It undergoes spontaneous polymerization if stored in pure form; due to this property, small quantities of stabilizers are added. Adding even a minimal amount of its polymer to the liquid triggers polymerization, which is exothermic (the mixture warms up to 80°C, approximately 175°F). This process is applied in surgery. Possible coagulation of adjacent tissues due to the high temperature is the major problem accompanying the method.

The authors make a mixture of a few milliliters of the liquid cement (before the polymerization) with solution of 3 mCi of 153Sm-EDTMP. The mixture is injected into the cavity after removal of tumor masses from the vertebral body. Then, the material hardens due to the polymerization reaction and should irradiate the remaining tumor rest.

The delivered local radiation dose can be easily estimated. If the volume of the liquid cement, in which the 153Sm-EDTMP is dissolved, is assumed to be only 1 ml (if it is a few milliliters, the calculated doses will be a few times lower), the energy delivered to the volume by the activity of 3 mCi (111 MBq) is as high as 1 J, which implies an absorbed dose of 1000 Gy. It must be emphasized, however, that the dose is produced by the beta rays, which are (almost) totally absorbed within the cement, and thus the radiation is not delivered to tissue. On the