What is Fact & what is Fiction: Total Joint Infections

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How important is getting a culture when infection is suspected?
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Frozen sections of samples taken intraoperatively for diagnosis of infection in revision hip surgery.

Nuñez LV, Buttaro MA, Morandi A, Pusso R, Piccaluga F.

PATIENTS AND METHODS:

Results of the analysis of frozen sections from samples of tissues taken during revision hip surgery of 136 probably infected prostheses

Samples of tissues were taken to be analyzed immediately from frozen sections, to be processed on a routine basis later, and to be referred for bacteriological cultures

A finding of 5 or more polymorphonuclear leukocytes / field at a magnification of 400x positive for infection
RESULTS:
The analysis of frozen sections for infection was in agreement with the results of routine histopathology in 134 of 136 cases. Comparison with the results of culture showed:
- a sensitivity of 85%,
- a specificity of 87%,
- a PPV of 79%, an NPV of 91%

_We believe that the method we have tested is of value in revision surgery when infection cannot be ruled out._
Usefulness of histological analysis for predicting the presence of microorganisms at the time of reimplantation after hip resection arthroplasty for the treatment of infection.

Bori G, Soriano A, García S, Mallofré C, Riba J, Mensa J.

Appropriate interpretation of a frozen section has a relatively high specificity and sensitivity for the diagnosis of infection when septic loosening of a prosthesis is suspected.

The results of culture were considered positive when the same microorganism was isolated in at least two samples.

Two histological criteria were used to diagnose infection:

(1) Criterion A (the Feldman criterion), defined as the presence of at least five neutrophils per high-power field (x400) in at least five separate microscopic fields.

(2) Criterion B (the Athanasou criterion), defined as the presence of at least one neutrophil per high-power field (x400), on average, after examination of ten microscopic fields.
RESULTS: Seven of the twenty-one patients had a positive result on culture, and the most common microorganism was coagulase-negative staphylococcus.

The sensitivity, specificity, positive predictive value, and negative predictive value of frozen-section analysis were

Feldman criterion (5 or more) 28.5%, 100%, 100%, and 73.6

Athanasou criterion 71.4%, 64.2%, 50%, and 81.8

The numbers of lymphocytes and plasma cells did not help in the diagnosis of infection.

Fibrosis was more common in patients without an infection.

CONCLUSIONS: The probability of infection is high when at least five neutrophils per high-power field are found in the periprosthetic tissue, but it is not possible to rule out infection when the number of neutrophils is less than five.
Aspiration of the hip joint before revision total hip arthroplasty. Clinical and laboratory factors influencing attainment of a positive culture.

Lachiewicz PF, Rogers GD, Thomason HC

results of hip aspirations in an attempt to determine clinical or laboratory factors that could help the surgeon to identify hips that are infected and that should be aspirated preoperatively

142 consecutive revision total hip arthroplasties
128 had preoperative aspiration once
14 had preoperative aspiration twice
The 14 aspirations were repeated for various reasons, most commonly to confirm the presence of an unusual organism.
21 (15 percent) of the 142 hips were infected, as demonstrated by the intraoperative culture. The initial aspiration was positive for nineteen hips. 17 of the 19 truly infected hips were associated with an abnormally elevated erythrocyte-sedimentation rate (mean, 80.8 millimeters per hour). 58 (50 percent) of the 116 hips that were not infected, and for which the results were available, also had an abnormally elevated erythrocyte-sedimentation rate (mean, 32.0 millimeters per hour).

The peripheral leukocyte count was not helpful in predicting infection.
Hips in which the implants had been in situ for more than five years were less likely to be infected (p = 0.008, Fisher exact test) than those in which the implants had been in situ for five years or less.

None of the infected hips in which the implants had been in situ for more than five years were associated with a normal erythrocyte-sedimentation rate.

In this study, preoperative aspiration of the hip joint had an excellent sensitivity and specificity with regard to the prediction of infection.

A selective approach to aspiration, as determined by the erythrocyte sedimentation rate and the amount of time that the implant has been in situ.
Can a metal allergy look like infection?
When it is not an infection: metal allergy after the Nuss procedure for repair of pectus excavatum

Rushing GD, Goretsky MJ, Gustin T, Morales M, Kelly RE Jr, Nuss D

PURPOSE: Increasing use of implantable bars for minimally invasive pectus excavatum repair has introduced metal allergy (nickel and chromium) to pediatric surgeons

This study was performed to evaluate metal allergy and its effects on treatment with the Nuss procedure in 862 patients
METHODS:

Retrospective review of a prospectively gathered database of patients undergoing the Nuss procedure.

Metal allergy was diagnosed either with the use of dermal patch or clinically, based on rash, fever, elevated erythrocyte sedimentation rate, cultures, and pathology specimens.

Data collection included demographics, an allergy to jewelry, and history of atopy.

Clinical outcomes including need for reoperation, removal of stainless steel bar, and replacement with titanium bar were evaluated.
RESULTS: Over an 18-year period (1987-2005), 862 patients underwent the Nuss procedure

19 (2.2%) were diagnosed with metal allergy with an average age of 14.7 years (9-23 years)

18 (95%) were males

9 (56%) A history of atopy was present

10 (63%) patients presented with rash and erythema

1 (6%) with granuloma

5 (32%) with pleural effusion

3 (15%) were diagnosed on preoperative screening
Stainless steel bars were removed because of allergic skin breakdown in 3 patients, with 2 patients requiring replacement titanium bars.

In all 3 of these patients, symptoms resolved after removal of stainless steel bars.

Titanium bars were placed in the 3 patients who were diagnosed preoperatively with metal allergy, without event.

CONCLUSIONS:

Allergy symptoms often are misdiagnosed as infection, but require different treatment. If a history of metal allergy or atopy is suggested preoperatively, the patient should be tested for metal allergy, and if positive, a titanium bar used. Because the consequences of metal allergy may include the need to replace the bar, pediatric surgeons should be aware of this occurrence.
Intolerance reactions to endoprostheses not explained by infection or mechanical failure may lead to allergological diagnostics, which mostly focuses on metal allergy.

However, also bone cement components may provoke hypersensitivity reactions leading to eczema, implant loosening, or fistula formation.

Elicitors of such reactions encompass acrylates and additives such as benzoyl peroxide, N,N-dimethyl-p-toluidine, hydroquinone, or antibiotics (particularly gentamicin).

Therefore, in the case of suspected hypersensitivity reactions to arthroplasty, the allergological diagnostics should include bone cement components.
A 63-year-old Japanese woman who had been taking 5 mg of prednisolone per day for rheumatic arthritis from the age of 23 years underwent surgery on the right knee, during which an orthopedic prosthesis made of an alloy of cobalt (Co) and chromium (Cr) was implanted, in November 2000. Two years and 7 months later, a painful edema developed over the right knee. Although repeated aspiration of the joint yielded a yellow-green fluid, the culture of which was negative, she was given antibacterial drugs
The prosthesis of her right knee broke in November 2003, and she underwent a 2nd operation to replace the Co and Cr alloy prosthesis in January 2004. One week after the 2nd operation, redness and swelling of her right knee developed, and suppurative drainage continued from the pin-hall of the wound. Although repeated bacterial and fungal cultures of pus were negative, she was given antibiotics. A 2-day closed patch test with a metal allergen from Torii Pharmaceutical Co. Ltd (Tokyo Japan) showed positive reactions to only Co and Cr in December 2004.
She underwent a 3rd operation to remove the Co and Cr alloy prosthesis of her right knee in February 2005, improved 2 months later.

A diagnosis of Co-Cr alloy allergy

Patch testing is indispensable for patients with persistent inflammation after implantation of a prosthesis made of an alloy of Co and Cr and for preoperative patients for whom implantation of a prosthesis made of metals is planned.
Can an infection focus seed to multiple joints over many years?
Total knee arthroplasty after prior bone or joint sepsis about the knee

Lee GC, Pagnano MW, Hanssen AD

incidence of deep prosthetic infection after total knee arthroplasty for patients with previous sepsis or osteomyelitis about the knee

Between 1989 and 1999, one surgeon did 20 consecutive primary total knee arthroplasties in 19 patients with a previous history of either septic arthritis or osteomyelitis about the knee

Antibiotic-impregnated cement was used in all patients
There was one (5%) recurrent deep periprosthetic infection for which the patient required resection arthroplasty at 3.5 years.

No patients required chronic antibiotic suppression.

With careful preoperative and intraoperative evaluation and the routine use of antibiotic bone cement for fixation, total knee arthroplasty, in patients with prior bone or joint sepsis about the knee can provide good pain relief, functional improvement, and an acceptably low rate of deep prosthetic infection.
Infections associated with dental procedures in total hip arthroplasty

LaPorte DM, Waldman BJ, Mont MA, Hungerford DS.

Dental procedures may lead to a transient bacteraemia lasting for up to 30 minutes.

Of the numerous cases of total hip arthroplasty (THA) reported which have been infected from haematogenous sources, dental procedures have been involved only infrequently.

Reviewed the records of 2973 patients after THA.

Late infections identified in 52 patients.
three (6%) were strongly associated with a dental procedure. Infection was diagnosed by culture from the affected joint. Streptococcus viridans was identified in two cases, Peptostreptococcus in one. One patient had diabetes mellitus and another rheumatoid arthritis. The dental operations all lasted for more than 45 minutes and no patient received perioperative antibiotics. Infection of a THA after dental procedures is more common than has been previously suspected. Patients with systemic disease, or who are undergoing extensive procedures, should be considered for prophylactic antibiotic treatment.
Don't forget to brush!!!
whether preoperative antibiotics interfered with the isolation of organisms from intraoperative tissue samples?

Organisms isolated from preoperative joint aspirate correspond to those cultures from intraoperative specimens

Retrospectively reviewed 171 patients undergoing TKA, diagnosed with periprosthetic infections from 2000 to 2005, who had a positive preoperative aspiration culture
72 of 171 antibiotics before surgery
99 of 171 no antibiotics before surgery

**Intraoperative culture was negative in nine of the 72 patients who received antibiotics: a false-negative rate of 12.5%**

An organism could not be isolated from intraoperative samples in eight of the 99 patients who did not receive preoperative antibiotics: a false-negative rate of 8%.

Administration of preoperative antibiotics to patients with a positive preoperative joint aspirate **did not interfere with the isolation of the infecting organism**
To evaluate the efficacy of cefuroxime, in minimizing the risk of per and postoperative infection complications in patients with urinary tract infection undergoing transurethral surgery.

86 patients (ASA I, II) with persistent urinary tract infection despite antibiotic therapy were studied.

A double blind protocol was followed.
Patients were randomly assigned to receive 10 minutes before surgery either I.V. cefuroxime (1.5 g) (group C, n = 39) or placebo (group P, n = 47) The incidence of postoperative blood cultures taken when clinical septic signs were present, was significantly lower in group C (0%) than in group P (21.7%) (p less than 0.05).

Thus, preoperative administration of a single dose of cefuroxime, reduces the incidence of per and postoperative bacteraemias in ASA I-II patients with persistent urinary tract infection
Are gm stains and cytology for crystals important in a suspected acute joint infection?
The objective of this study was to determine the incidence of septic arthritis in the presence of joint crystals. The study population included all patients with synovial fluid crystals in the joint aspirate sent to the laboratory during the 7-year study period. Septic arthritis was defined as a positive synovial culture.
265 joint aspirates containing crystals
183 (69.0%) contained gout crystals,
81 (30.6%) contained pseudogout crystals,
1 (0.4%) contained both.
4 (1.5%) of the aspirates had positive cultures

The mean synovial WBC of the 4 samples with
concomitant crystals and septic arthritis was 113,000
(72,700-153,200) which was significantly higher than
the entire population at 23,200 (19,400-27,000)
all 4 patients with concomitant disease had significant co-morbidities and synovial WBC counts greater than 50,000

Septic arthritis and acute crystal-induced arthritis can occur simultaneously; there were 4 cases (1.5%) of concomitant disease in the study population

The presence of crystals cannot exclude septic arthritis with certainty
Gout-induced arthropathy after total knee arthroplasty: a report of two cases
Archibeck MJ, Rosenberg AG, Sheinkop MB, Berger RA, Jacobs JJ

Gout, although relatively rare in joint replacements, can present as an acute or chronic painful knee or hip arthroplasty

Gout and acute infection of a joint replacement can be difficult to differentiate, with the physical examination and laboratory study results frequently being similar

Both conditions can present with a rapid onset of joint pain, swelling, erythema, and constitutional symptoms, including fevers and malaise
Laboratory findings in both conditions often include an elevated leukocyte count, erythrocyte sedimentation rate, and C-reactive protein level. Birefringent, needle-shaped crystals in the synovial fluid confirm the diagnosis of gout.

The current study includes a review of the literature and presents two cases of gout after total knee arthroplasty. These cases suggest that in situations of suspected sepsis without synovial fluid crystals, operative intervention is indicated with a presumed diagnosis of septic arthritis.
The identification of chalky white or yellow deposits in the synovium or bone is highly suggestive of gout.

The definitive diagnosis is made by polarized light histologic evaluation of these tissues.

*If these deposits are present in the absence of a positive preoperative culture, positive Gram stain for bacteria, or component loosening, component retention is indicated.*