PROSTHETIC INFECTION TREATMENT BY USING ANTIBIOTIC CEMENT SPACER WITH CUSTOM MOLD: 05 CASES REPORT

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Background: According to statistical data of many countries in the wold, the more proportion of patients in hip replacement have, the more prosthetic infection have been treated. In Vietnam, treatment of prosthetic infection is often difficult beacause of antibiotic resistance, high cost treatment and difficult rehabilitation in post-surgery. Nowadays, there are many methods of treatment for prosthetic infected patients, using antibiotic cement spacer for prosthetic infection have applied in common of a lot of countries all over the wold. We report five cases hip prosthetic infection treatment by using antibiotic impregnated cement spacer with custom mold. **Aim of study:** Inform 05 cases hip prosthetic infection treatment by using antibiotic impregnated cement spacer with custom mold. **Methods:** Serial cases report.

Keywords: *Prosthetic infection, Antibiotic cement spacer.*

1. INTRODUCTION

Periprosthetic joint infection (PJI) is a truly devastating complication of total joint arthroplasty (TJA) [1]. It adversely impacts the patient, by causing functional disability, increased morbidity and also mortality [2]. The management of PJI currently is far from optimal, often resulting in the need for prolonged hospitalization, administration of long term intravenous antibiotics, and the need for multiple surgical interventions [3]. The protracted course of treatment results in a massive financial burden on the treating institution and the health system on a national level. The incidence of PJI has been increasing steadily over the last decade, both in terms of the absolute number of cases, as well as the proportion of primary total hip and knee arthroplasties that succumb to infection [3, 4].

The resistance profile of infecting organisms has also changed over the recent years with an increase in the number of surgical site infections and PJIs being caused by antibiotic resistant organisms [5, 6].

While recurrence of PJI after treatment is not common, eradication rates as low as 16 - 37% have been shown with infection of certain organisms treated with less-aggressive strategies [7, 8].

The extensive treatment required to appropriately treat a patient with PJI is significantly more expensive than that for aseptic loosening after primary TJA [3], and treating institutions are experiencing a decline in reimbursement along with the development of penalties for infection-associated readmission.

2. DIAGNOSIS

2.1. History and Physical Examination

A thorough history and physical examination are important to identify the type of PJI encountered and assess patient's risk factors and suitability for surgical treatment. Acute infection according to Tsukayama et al [9] presents within 4 weeks of the index procedure and is characterised by continuous pain and an erythematous, swollen and fluctuant wound with purulent discharge and occasional wound dehiscence. Systemic symptoms such as fever and chills may also occur. Chronic infection on the other hand, occurs after 4 weeks from the index procedure [9] and is characterised by gradual deterioration of function, persistent pain from the time of the operation and a draining sinus. Relevant history includes prolonged wound discharge and wound healing after multiple courses of antibiotics. A previous history of infection is also important especially in tuberculosis where reactivation of infection may occur after a prolonged period of quiescence. Haematogenous infection can occur at any time after the index operation [9] and typically involves a prosthesis that has been functioning well for months or years. The most frequent primary seeding site is skin and soft tissue infections [10]. However, other sources of infection may include the urinary, respiratory, and gastrointestinal tract, as well as recent dental work [11]. This type of infection is more likely to occur in immunocompromised patients and hence the importance of carefully assessing this subset of patients for comorbidities such as diabetes,

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chronic renal impairment, inflammatory arthropathy and malignancies. Early diagnosis of PJI in a well-fixed implant may allow salvage of the prosthesis using an aggressive early debridement strategy with exchange of modular components, whereas a delay in diagnosis or in the case of chronic infections, a single or staged exchange procedure may be more appropriate to control the infection. In either case, rapid intervention based on thorough assessment has been deemed a primary prognostic factor for infection control as it may prevent biofilm formation by the infecting bacteria [12].

Musculoskeletal Infection Society (MSIS)	Centers for Disease Control (CDC) on PJI
Major criteria:	Major criteria:
1. There is a sinus tract communicating with the prosthesis; or	1. A sinus tract communicating with the joint; or
2. A pathogen is isolated by culture from 2 or more separate tissue or fluid samples obtained from the affected prosthetic joint; or	2. Two positive periprosthetic tissue or fluid cultures with matching organisms; or
Minor criteria:	Minor criteria:
3. When 4 of the following 6 criteria exist:	3. When 3 of the following 5 criteria exist:
(a) Elevated ESR and CRP	(a) CRP >100 mg/L AND ESR >30 mm/h
(b) Elevated synovial WCC	(b) Synovial fluid WCC >10,000 cells/μl OR ++ change on leucocyte esterase strip test of synovial fluid
(c) Elevated synovial polymorphonuclear percentage (PMN%)	(c) Elevated synovial fluid PMN percentage (>90 %)
(d) Presence of purulence in the affected joint	(d) A single positive periprosthetic tissue or fluid culture
(e) Isolation of a microorganism in one culture of periprosthetic tissue or fluid, or	(e) Positive histological analysis of periprosthetic tissue (more than 5 pmns per high power field)
(f) Greater than 5 neutrophils per high-power field in 5 high-power fields observed from histologic analysis of periprosthetic tissue at ×400 magnification	

2.2. Serological Tests

The white blood cell count (WBC) and polymorphonuclear (PMN) percentage have been found to have a minimal role in routine workup of patients with suspected PJI due to low sensitivity and specificity [13, 14]. However, the C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR) should be used as a screening tool for all patients with suspected infection. The CRP level reaches maximum values within 48 h from surgery and returns to normal within 3 weeks, whereas ESR may remain elevated for months post surgery [12, 15]. Therefore, an elevated CRP is more accurate in identifying infection [16]. A CRP level of >10 mg/L and an ESR level of >30 mm/h correlated with PJI in all total hip arthroplasties (THAs) that were complicated by deep infection in two studies [14]. As a result, authors recommended combining both tests to improve the accuracy of diagnosing infection. It is important though to recognise that ESR and CRP are nonspecific markers of inflammation and that they are frequently elevated in other inflammatory and infectious conditions as well as malignancy, which may cause false-positive results for PJI. Additionally, they are elevated in the early postoperative period after a routine hip or knee replacement. Therefore, Bedair et al. [17] and Yi et al. [18] defined the threshold values for CRP in acute postoperative PJIs of the hip and knee as 93 and 95 mg/L, respectively. Greidanus et al. [19] suggested that both ESR (sensitivity, 0.93; specificity, 0.83; positive likelihood ratio, 5.81; accuracy, 0.86) and CRP (sensitivity, 0.91; specificity, 0.86; positive likelihood ratio, 6.89; accuracy, 0.88) have excellent diagnostic test performance. In a recent study of 320 PJIs, Zajonz et al. [20] showed no differences between hip and knee arthroplasty patients regarding levels of inflammatory markers. Parvizi suggested in a recent study [21] that the best diagnostic strategy after confirming abnormal CRP and ESR levels would be a diagnostic aspiration of the joint. On the other hand, the American Academy of Orthopaedic Surgeons Clinical Practice Guidelines on PJIs [22] suggest that even normal levels of ESR and CRP do not rule out PJI, and that these tests alone should not be relied on for definite exclusion of PJI.

2.3. Synovial Fluid Tests

Hip and knee aspirations are performed using the surgeon's preferred technique. However, a strict aseptic technique is essential to reduce false- positive results and prevent iatrogenic periprosthetic infection. Fluoroscopic guidance is usually utilised for the hip joint but ultrasound-guided hip aspirations have also been reported [23]. Local anaesthetic and contrast material should

be avoided due to the potential bactericidal effect and associated falsenegative results [24, 25]. Similarly, it is recommended that patients stop any antibiotics for a minimum of 2 weeks prior to obtaining synovial fluid or cultures to avoid false-negative results [26]. The synovial fluid should be sent for microbiologic cultures, WBC count and differentials. Blood culture flasks should be used for the synovial fluid [27], and specialised media are required for suspected atypical infections, such as Lowenstein-Jensen media for mycobacteria [28] or Sabouraud's dextrose agar for fungi [29]. Prolonged culture incubation for 14 days may be required if P. acnes, fungi or mycobacterium are suspected [30]. However, cultures for mycobacterium and fungi should not be done routinely as this would not be cost-effective [31]. If the culture results are negative in the setting of elevated synovial and serum markers suggestive of infection, repeat aspiration should be performed prior to surgery or initiation of antimicrobial treatment [32]. The optimal cut-points of synovial WBC count, PMN percentage and serum CRP levels for diagnosing acute and chronic hip and knee PJIs are detailed in this table [17, 18, 33].

	Acute		Chronic	
	TKA	THA	TKA	THA
Serum CRP (mg/L)	95	93	10	10
Synovial WBC Count (cells/μL)	27,800	12,800	1100–4000	3000
Synovial PMN Cells (%)	89	89	64–69	80

Abbreviations: *TKA* total knee arthroplasty, *THA* total hip arthroplasty, *CRP* C-reactive protein, *WBC* white blood cell, *PMN* polymorphonuclear

Leucocyte esterase (LE) testing has recently been added to the minor diagnostic criteria for PJIs used by the ICG/CDC due to the low cost, easy applicability and high sensitivity (80%) and specificity (100%) rates reported [34]. However, it is important to remember that the presence of blood in the synovial fluid aspirates, may negatively affect the interpretation of the LE strip but that centrifuging the sample overcomes this problem without affecting the accuracy of the test [35, 36].

2.4. Imaging Modalities

Plain radiographs should be included in any workup for infected joint replacements. However, they are neither sensitive nor specific for detection of infection. Radiographic findings including loosening and osteolysis are common to both septic and aseptic failures. On the other hand, periosteal new bone formation and endosteal scalloping, are more suggestive of infection but are not seen in all cases [14]. Computed tomography (CT) provides detailed analysis of bony structures and may show evidence of soft tissue collections. However, it is limited due to metal artefact, is associated with low sensitivity for detecting PJI and exposes patients to high doses of radiation alongside the significant cost associated with using them [37]. Magnetic resonance imaging (MRI) is also limited due to metal artefact and studies relating to accuracy of metal artefact reduction sequence (MARS) MRIs are limited in the literature [38].

2.5. Intraoperative Assessment

Intraoperative assessment at the time of revision surgery starts with evaluating the tissue appearance and classically performing gram stains of fluid or tissue samples collected. However, it is important to recognise that neither tissue appearance nor gram staining are reliable indicators for ruling in or ruling out infection [14]. Intraoperative cultures are presumed to be the gold standard for identifying PJI. However, they are subject to false-negative and false-positive results [9]. As with joint aspiration, careful technique and withholding antibiotics for at least 2 few weeks preoperatively are essential to reduce false negatives [26]. The definitive diagnosis of PJI is made when the same organism is isolated from at least two intraoperative cultures [33]. However, various studies suggest that three to six samples are collected from superficial, deep and periprosthetic tissues in order to obtain an accurate diagnosis of infection [8, 33, 39]. The explanted component should also be sent to the microbiology lab for sonication as this improves sensitivity of the cultures

from 61 to 78% even with patients who are receiving antibiotic treatment [40]. The incubation period for cultures should be at least 7 days. However, reports published recently suggest prolonging incubation for 14 days as this increases the chances of identifying organisms that otherwise may remain culture negative (26.4% additional cases were classified as infected at 14 vs. 7 days) [30, 41].

3. TREATMENT ALGORITHM

One of the most important questions in prosthesis-related infection from a clinical point of view is which treatment method is optimal for this patient at this point. To answer this question, we have developed a treatment algorithm to guide our decisions on the one hand. On the other hand, we have constructed our own database of patients, not only including the types of bacteria involved and technical matters like bone stock but also comprising many patient factors that are correlated to treatment outcome.

3.1. Debridement, Antibiotics, Irrigation, and Retention

When confronted with an acute PJI with a well-fixed prosthesis, DAIR is the treatment of choice. Our protocol makes no difference between cases that present in the early postoperative period or those that present late and may or may not have a haematogenous infection. As long as patients have symptoms for less than 4 weeks, we advocate DAIR. In the emergency room, no antibiotics are given to patients if they have a possible PJI. Soft tissue debridement is performed until bleeding surfaces are achieved and a set of five cultures is taken. A sample is also sent for histological examination. If during the surgical procedure loose components are found, they are removed, but not re-implanted at the same time. The wound is instilled with 0.37% solution of povidone–iodine for 3 min. Irrigation is performed with at least 6 l of saline using pulsatile lavage. Dead space can be managed with gentamicin beads or gentamicin collagen fleeces. To reduce wound leakage, these are left only underneath the deep fascia. Wounds are closed in customary fashion without any wound drains. After the last culture has been taken, intravenous flucloxacillin (8 g/24 h, continuous infusion) is started. Treatment is redirected based on the outcome of cultures. Rifampicin is started in the case of staphylococcal infection and if proven susceptible to prevent mono-treatment, which has been shown to lead to rifampicin resistance. Removal of all foreign body material may offer better chance of infection control, but results of DAIR indicate that this is not necessary in the majority of cases. Furthermore, it exposes the patient to greater surgical risks (increase in blood loss, operating time and perioperative fracture), which is all the more threatening in a patient with an acute infection and a septic profile. Renewing exchangeable parts has shown to have good results in the literature. It also makes sense, bearing in mind that the biofilm on those parts that are exchanged no longer needs to be eradicated. Furthermore, it allows for a more radical debridement of the joint lining. However, not all prostheses used in our hospitals have parts that can be removed without sacrificing soft tissue balance and some parts are no longer available off the shelf. For this reason, we have chosen only to remove parts that can *easily* be exchanged. This lowers the threshold for starting the treatment protocol as soon as possible, since none of our staff members has to wait for a hip, knee or shoulder specialist to be present. Although there will always be discussion on the time limit until when DAIR can be started (particularly if measured in weeks), we feel that a delay in the start of treatment of a couple of days does matter in the majority of acute PJI presentations.

3.2. One-Stage Protocol

A one-stage protocol involves a single operation in which the prosthesis is removed and the debridement is carried out, after which the new prosthesis is directly implanted. This has the advantage that the patient can start functional recovery without the delay caused by a prosthesis-free interval waiting for the second stage. Often, it is thought that surgical time and costs are reduced as well. This may not be the case, since provisional wound closure and re-prepping and re-draping the patient before continuing with the re-implantation with a fresh set of instruments (sometimes referred to as a three-step procedure) are mandatory from a hygiene point of view. Nevertheless, the overall costs of treatment with a one-stage protocol may be lower thanks to shorter hospitalization time and shorter antibiotic courses.

3.3. Two-Stage Protocol

A two-stage protocol has two basic advantages over a one-stage. Firstly, it leaves room for another debridement. Secondly, this debridement results in material that can be used to further diagnose the infection being treated. This is particularly interesting since biofilm infections have been found to be caused by multiple strains in almost 20% of cases (Holleyman et al. 2016) [42]. Having treated the strain(s) that was/were found in the

first operation, taking cultures during the second operation makes it possible to find strains that went undetected after the first procedure. The reason for not finding them at first may lie in the relative ease of growth of common virulent strains versus small colony variants and other slow-growing micro-organisms. In addition, if the new strains were resistant to the treatment so far, redirecting treatment to cover these strains as well logically results in better outcome.

Finally, a two-stage protocol leaves room for adapting the initial treatment aim to clinical reality. Serious complications may preclude further antibiotic treatment or surgery. Failure to achieve infectious control may necessitate additional debridements. Discussing these circumstances with the patient may well lead to accepting a more certain outcome of a Girdlestone procedure or arthrodesis over a protracted and more hazardous course toward a functioning prosthetic joint.

A two-stage protocol obviously has drawbacks as well. The costs of treatment to society are perceived to be higher. With the outcomes of any infection treatment being dependent on more factors than just the one - or two-stage protocol, it can be argued that a one-stage protocol may be favourable (Kendoff and Gehrke 2014) [43]. Another drawback of the two-stage protocol directly involving the patient is the morbidity during the prosthesis-free interval the second-stage surgical procedure and after the second operation. Also, antibiotic courses are generally more prolonged than with one-stage protocols, which could give rise to antibiotic-related complications. To minimize functional impairment in the interval between the operations, a spacer made of antibiotic-loaded acrylic cement is commonly left in place. The spacer fills up the dead space created by removal of the prosthesis and prevents soft tissue contracture. Also, antibiotic-loaded bead chains can be used. The use of a spacer has been shown to contribute to an increase in antibiotic concentrations locally, but not to the same degree as anti biotic beads (Anagnostakos et al. 2009) [44]. The use of bead chains leaves the joint less functional, but can be appreciated as a means of providing the area of infection with a higher antibiotic concentration than can be achieved through treatment (intravenous or oral) alone.

We opt for gentamicin beads in difficult cases instead of a spacer, since the beads have more predictable elution characteristics related to the respective surface areas than spacers do (Holtom et al. 1998) [45]. In order to be able to choose the optimal treatment and inform the patient in this respect, it is necessary to have insight into the factors that predict success or failure in each specific case. Most treatment protocols are based on the work of the Lausanne group or the Endo Klinik (Zimmerli et al. 2004; Kendoff and Gehrke 2014) [43, 46]. Treatment is based on the duration of the PJI, the stability of the implant, the clinical situation of the patient as well as the (preoperative) identification of the micro-organism involved and the feasibility of antimicrobial treatment. Unfortunately, most of these issues require clinical judgement that is hard to describe scientifically. This results in a lack of objective data that could lead to an overestimation of the effect of treatment, or in statistical terms a type-1 error.

Furthermore, almost all clinical studies on PJI are hampered by serious limitations such as retrospective study design, small group sizes, heterogeneous groups mixing acute and chronic PJI and various joints involved. This leads to an increased probability of a type-2 error when comparing study groups. As a result it is all the more difficult to find a difference in the effect of various treatment protocols. The presence of such a difference may be cloaked by the large number of theoretically relevant factors that were not distributed evenly among the study groups and could not be corrected for.

4. CASES STUDY REPORT

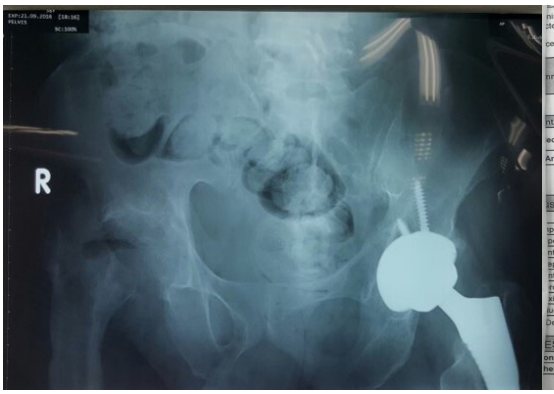
4.1. First case

A male, 59 years old, farmer, lives in Mo Cay, Ben Tre porvince. This patient has diabetes type 2 for 10 years, he was still on treatment with glucose level in control. In 2011, he was diagnosed with bilateral femoral trochlear necrosis and been through a left hip joint replacement surgery in hospital X. In 2013, he was operated with the right one. 1 year after, he has symptoms of swelling, hot, readness and painful in the left buttock and thigh area, he was hospitalized and debrided for 3 months. He was discharged after that and antibiotics treatment. On July 2016, he was in lot of pain on the same area with an abscess 3-5cm, he was debrided in hospital X. He was transferred to Cho Ray hospital after 1 month in the unimproved infectious condition.

Serological Tests: RBC: 4.27 T/L, WBC: 8.57 G/L (Neu: 54.4%), Glycemie 123 mg%, BUN: 9mg/dL, Creatinin 1.5 mg/dL. SGOT: 12 U/L, SGPT: 25 U/L.

He was debrided, synovial fluid tests, antibiogramme and VAC drainage.

Synovial fluid tests result: Enterococcus Faecium, multiple antibiotic resistence.



nism Quantity:
ted Organism : Enterococcus faecium
e: DICH
Collected: Sep 30, 2016
nments:

ntification Information	Analysis Time:	5.00 hours	Status: Final
ected Organism	91% Probability	Enterococcus faecium	
	Bionumber:	036047265771771	
Analysis Messages			

sceptibility Information — Analysis Time: 12.50 hours — Status: Final

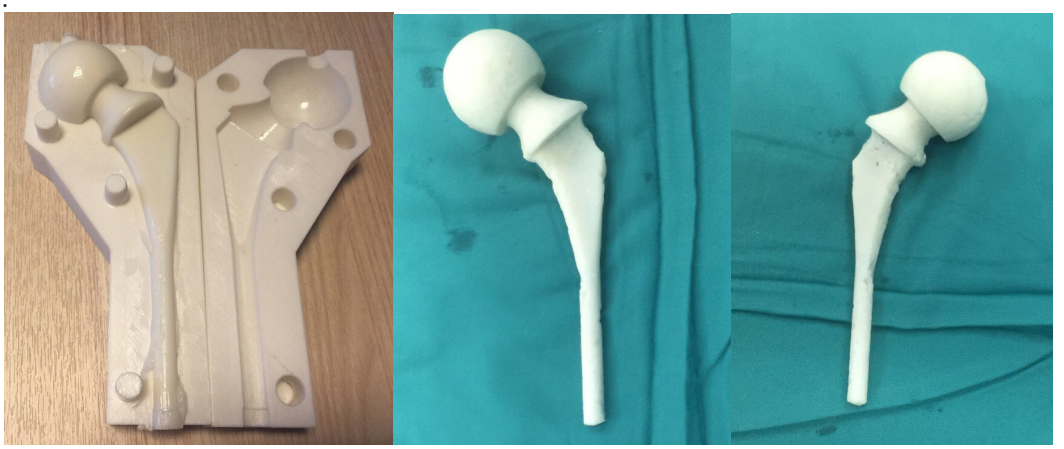
Antimicrobial	MIC	Interpretation	Antimicrobial	MIC	Interpretation
picillin	>= 32	R	Erythromycin	<= 0.25	S
penem	>= 16	R	Clindamycin	<= 0.25	*R
ntamicin High Level (synergy)	SYN-R	R	Linezolid	2	S
ptomycin High Level (synergy)	SYN-S	S	Teicoplanin	<= 0.5	S
ntamicin			Vancomycin	>= 32	R
floxacin	>= 8	R	Tetracycline	<= 1	S
floxacin	>= 8	R	Tigecycline	<= 0.12	S
ucible Clindamycin Resistance			Trimethoprim/Sulfamethoxazole	<= 10	*R

Deduced drug *= AES modified **= User modified

ES Findings

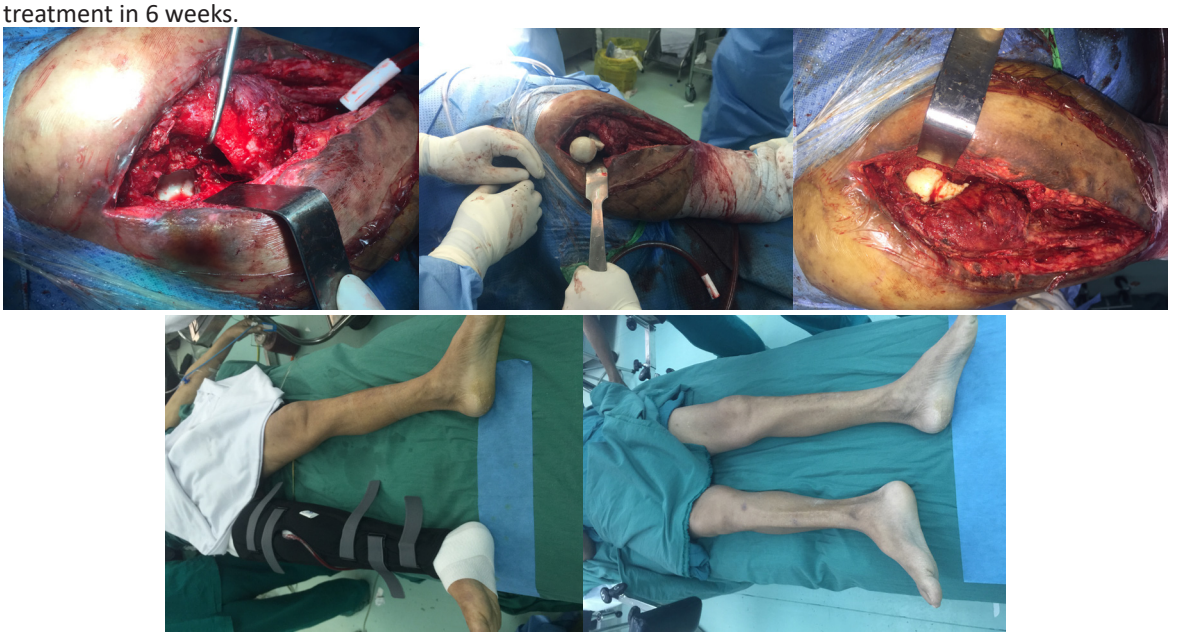
nfidence:	Consistent	
henotypes flagged for review:	GLYCOPEPTIDES	RESISTANT (VAN B LIKE)

After 2 time debridement and VAC drainage, he was impregnated with antibiotic cement spacer to custom mold.

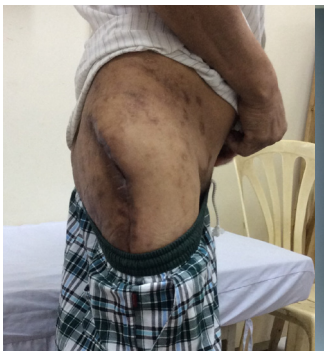


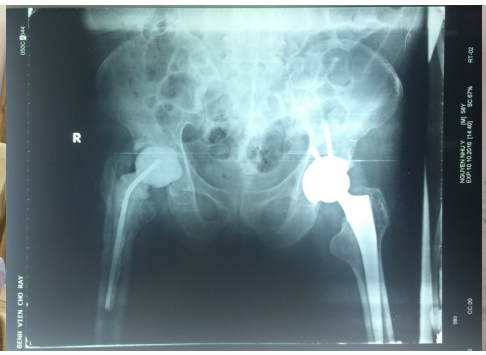
Antibiotic was used are Teicoplanin 1,2 g, and Vancomycin 2g

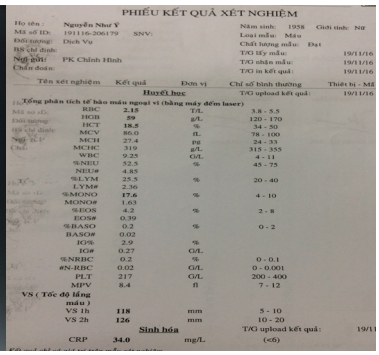
He was discharged 2 weeks after with the infection in control, dry wound. He keeps on using oral antibiotic treatment in 6 weeks.



After 1 month, he checks-up in Cho Ray hospital, wound is healed, left leg function is good; infectious condition was improved. Serological Tests: RBC 4.58 T/L, WBC: 6.66 T/L (Neu: 58.9%), CRP: 56 mg/L, Vs: 1h 39, 2h 58, Procalcitonin: 0.134 ng/ml.







PHIẾU KẾT QUẢ XÉT NGHIỆM

Tên xét nghiệm	Kết quả	Đơn vị	Chỉ số bình thường
Huyết học			
Tổng phân tích tế bào máu ngoại vi (bằng máy đếm laser)			
RBC	2.15	T/L	3.8 - 5.5
HGB	59	g/L	120 - 170
HCT	18.5	%	34 - 50
MCV	85.0	fL	78 - 100
MCH	27.4	pg	24 - 33
MCHC	319	g/L	315 - 355
WBC	9.25	G/L	4 - 11
%NEU	52.5	%	45 - 75
NEU#	4.85		
%LYM	25.5	%	20 - 40
LYM#	2.36		
%MONO	17.6	%	4 - 10
MON#	1.63		
%EOS	4.2	%	2 - 8
EOS#	0.39		
%BASO	0.2	%	0 - 2
BASO#	0.02		
IG%	2.9	%	
IG#	0.27	G/L	
%NRBC	0.2	%	0 - 0.1
#N-RBC	0.02	G/L	0 - 0.001
PLT	217	G/L	200 - 400
MPV	8.4	fl	7 - 12
VS (Tốc độ lắng máu)			
VS 1h	118	mm	5 - 10
VS 2h	126	mm	10 - 20
Sinh hóa			
CRP	34.0	mg/L	(<6)

3 months later, he checks-up in Cho Ray hospital, the wound was healed, left hip function is good, he can walk with crutch without left leg non wear-bearing, no infectious condition was noticed.

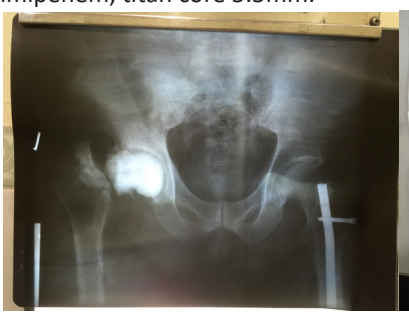
Serological Tests: RBC 5.48 T/L, WBC: 6.89 T/L (Neu: 53.9%), CRP: 17 mg/L, Vs: 1h 16, 2h 27.

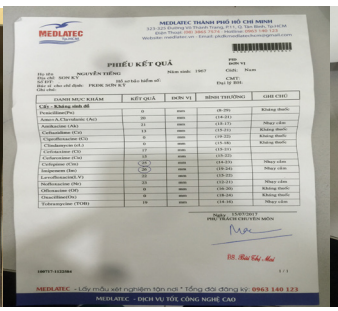
4.2. Second case

A male, 50 years old, saler, lives in Quang Nam province, Viet Nam. This patient has been painful at left hip since 2009. Then he was operated total hip reaplacement in 2010 at X hospital with diagnosis: avascular necrosis of left hip. 01 year later, he has got infectious condition at incision: internal medicine, antibiotics at home. On February 2017, he felt swelling, pus drainat incision. He has been addmitted to X hopstial, operaetd debridement, VAC in three times. On May, 2017: debridement, removed the prothesis, used PROSTALAC and then transferred to Cho Ray hospital .

Serological Tests:RBC: 6.27T/L, WBC: 11.57G/L (Neu: 54.4%), Glycemie 100mg%, BUN: 9mg/dL, Creatinin 1.5mg/dL. SGOT: 29U/L, SGPT: 25U/L.

He has operated debridement, pus culture, antibiogramme, VAC drainage. After three times VAC drainage, he has been debrided, cemented spacer. Indeggrient of spacer: two packges of cement, 4gr vancomycin, 4gr imipenem, titan core 5.5mm.





MEDLATEC THÀNH PHỐ HỒ CHÍ MINH

PHIẾU KẾT QUẢ

DANH MỤC KHÁM	KẾT QUẢ	ĐƠN VỊ	BÌNH THƯỜNG	GHI CHÚ
CẤY - Không sinh ổ				
Penicillin(Pe)	0	mm	(8-28)	Không thuần
Amox/A.Clavulanic (Am)	20	mm	(14-21)	Nhạy cảm
Ampicillin (Am)	11	mm	(14-21)	Không thuần
Cefuroxime (Cu)	0	mm	(18-22)	Không thuần
Cyprofloxacin (Ci)	0	mm	(15-18)	Không thuần
Clindamycin (Cl)	17	mm	(19-21)	Nhạy cảm
Cefuroxime (Cu)	15	mm	(15-22)	
Cefepime (Cm)	(25)	mm	(14-21)	Nhạy cảm
Imipenem (Ipe)	(26)	mm	(19-24)	Nhạy cảm
Levofloxacin(LV)	22	mm	(15-22)	
Norfloxacin (No)	23	mm	(13-21)	Nhạy cảm
Ofloxacin (Of)	0	mm	(16-20)	Không thuần
Oxacillin(Ox)	0	mm	(18-24)	Không thuần
Tobramycin (TOB)	18	mm	(14-18)	Nhạy cảm

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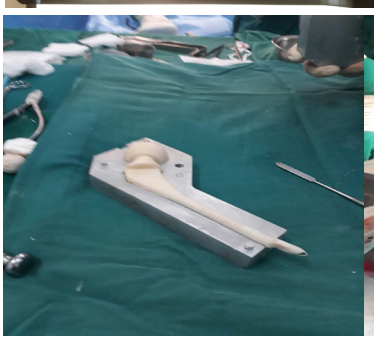
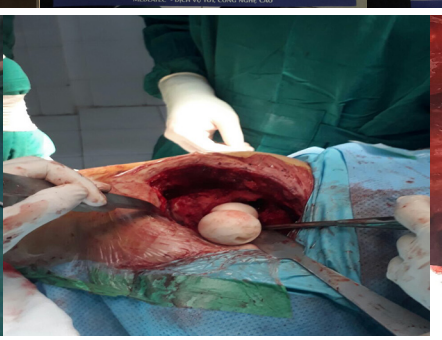
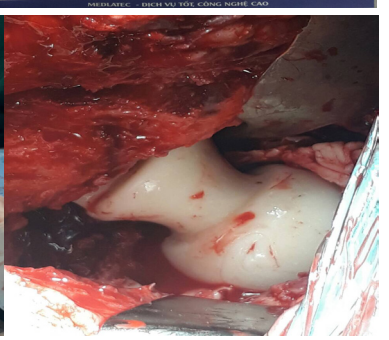
PHIẾU KẾT QUẢ

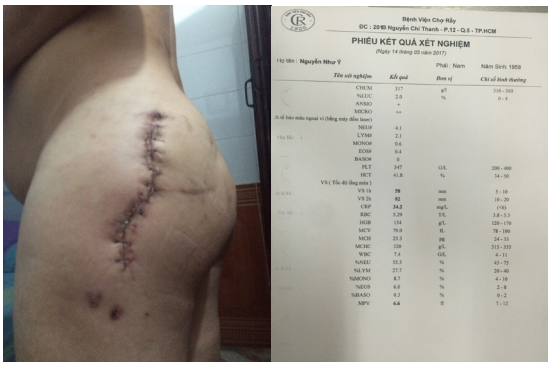
DANH MỤC KHÁM	KẾT QUẢ
CẤY - Không sinh ổ	
Tên vi khuẩn gây bệnh	Staphylococcus aureus



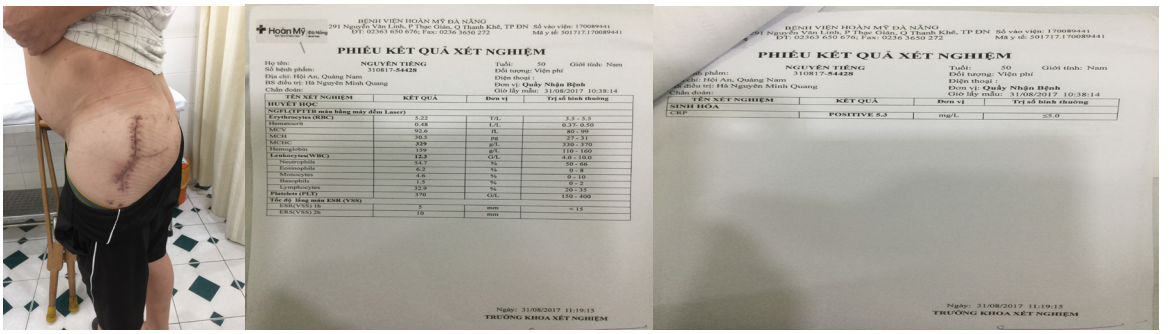




• Three weeks pos-operation: the wound was healing, WBC: normal, ESR 1h:58 mm, 2h: 84 mm, CRP: 34.2 mg/l



- 2 months later: healing wound, uninfectious condition, WBC: normal, ESR: normal, CRP: 5,5mg/l.



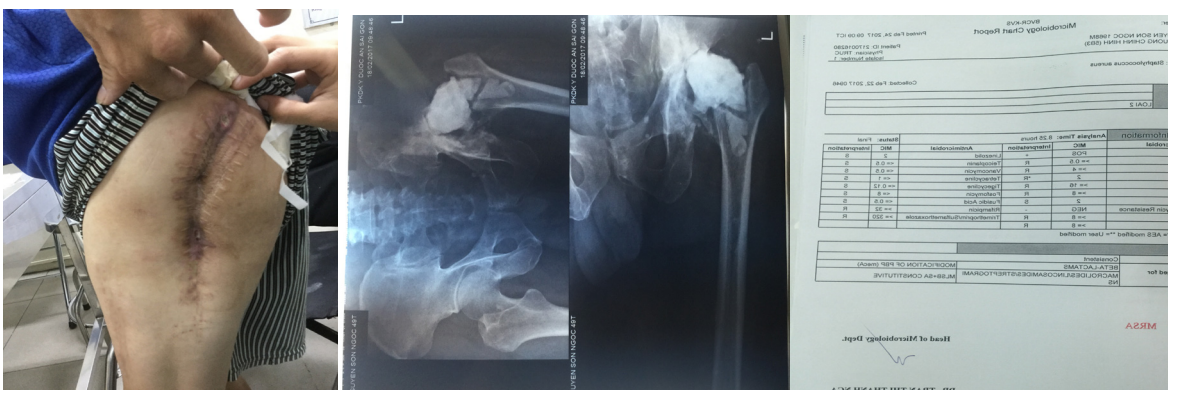
4.3. Third case

A male patient, 49 years old, born in Binh Duong, Vietnam. In 2015, this patient suffered from traffic accident (by train), then he admitted to hospital X with diagnosis: multi injuries, fracture of the posterior wall of acetabulum, fracture of the left femoral head. Patient was operated for total hip replacement. After 3 weeks of operation, patient has infection after hip replacement, in hospital X he was debrided with VAC (13 times).

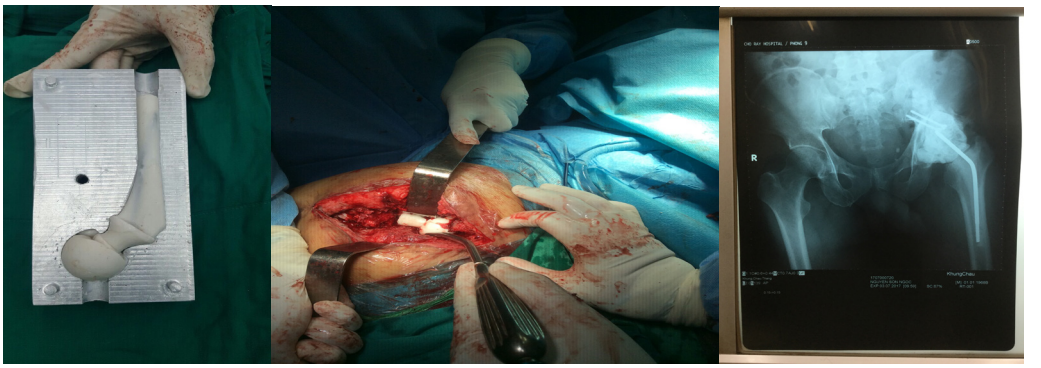
On January 2017, His infection are not reduced, patient was removed all component. After one month, the infection was not reduced, patient was transferred to Cho Ray hospital.

Serological Tests: RBC: 6.27 T/L, WBC: 7.79 G/L (Neu: 54.4%), Glycemie 98 mg%, BUN: 9 mg/dL, creatinine 1.5 mg/dL. SGOT: 23 U/L, SGPT: 21 U/L. ESR: 1h 22 mm, 2h 47 mm. CRP: 11.2mg/L.

Synovial fluid tests result: Staphylococcus aureus, MRSA.

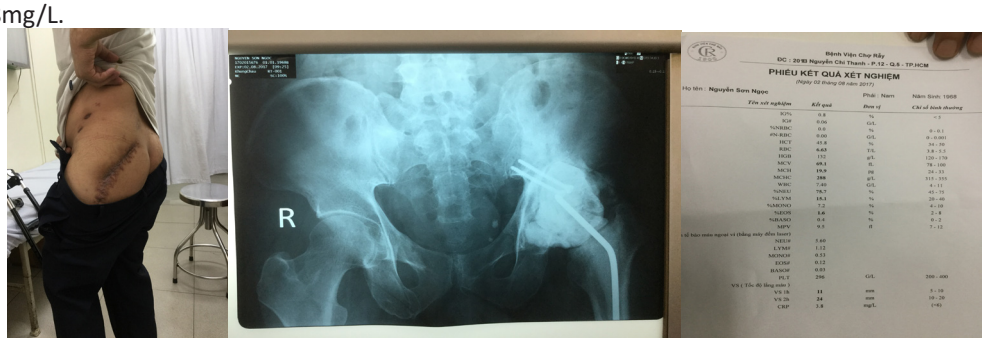


Patient was debrided and VAC, synovial fluid tests, IM antibiotic. After 03 times used VAC, he was operated again, and used PROSTALAC made by cutom mold. The spacer component consists of: 02 packages of cement (40 gr type), 1.2 gr Teicoplanin + 4 gr of vancomycin. Titanium core 5.5 mm.



Results after 1 month of follow-up: healing wound, normal WBC results, ESR: 1h: 22 mm, 2h 47 mm. CRP: 11.2mg/L.

Results after 3 months of follow-up: healing wound, normal WBC results, ESR: 1h: 11 mm, 2h 24 mm. CRP: 3.8mg/L.



Results after 6 months of follow-up: wounds healed, normal WBC results, ESR: 1h: 2 mm, 2h 8 mm. CRP: 2.9mg/L. The hip can be replaced.

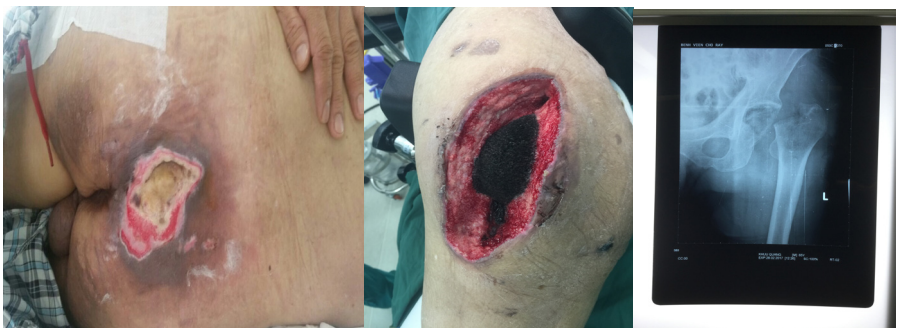
Case 4

A male patient, 65 years old, farmer, he lives in Tra Vinh, Vietnam. In 2016, patient had occupational accidents, admitted into hospital X with diagnosis: broken left femur neck fracture. The patient was hospitalized with hip replacement. After surgery for 4 weeks, he infected after hip replacement, then he was debrided and VAC (7 times).

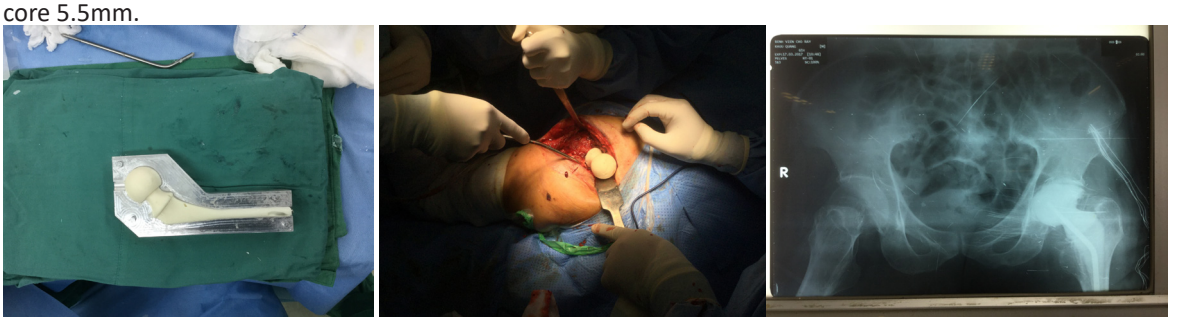
On January 2017, the infection was not resolved, the patient was removed prothesis, temporary skeletal traction on the Braun frame. After 1 month, the infection was still not decreased, the patient was transferred to Cho Ray hospital with the infection after the replacement of the hip with the bed sore with the same area.

Serological Tests: RBC: 5.27 T/L, WBC: 10.79 G /L (Neu: 54.4%), Glycemie 101 mg%, BUN: 7 mg/dL, creatinine 1.5 mg/dL. SGOT: 22 U/L, SGPT: 46 U/L. ESR: 1h 48mm, 2h 67mm. CRP: 101,2mg/L.

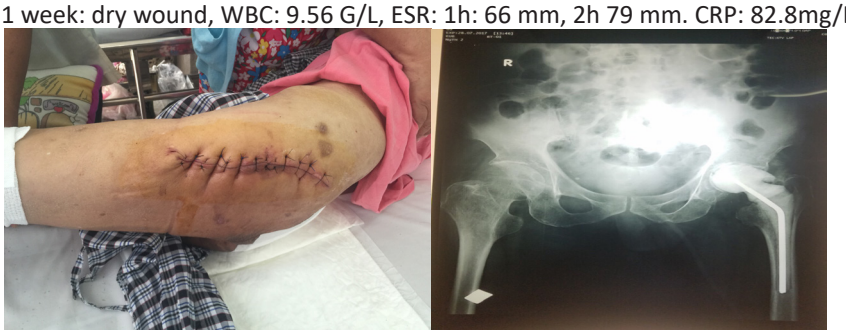
Synovial fluid tests result: Acinetobacter Baumannii, Enterobacter Cloacae and Klebciella Pneumoniae, antibiotic sensitivity: Colisntin.



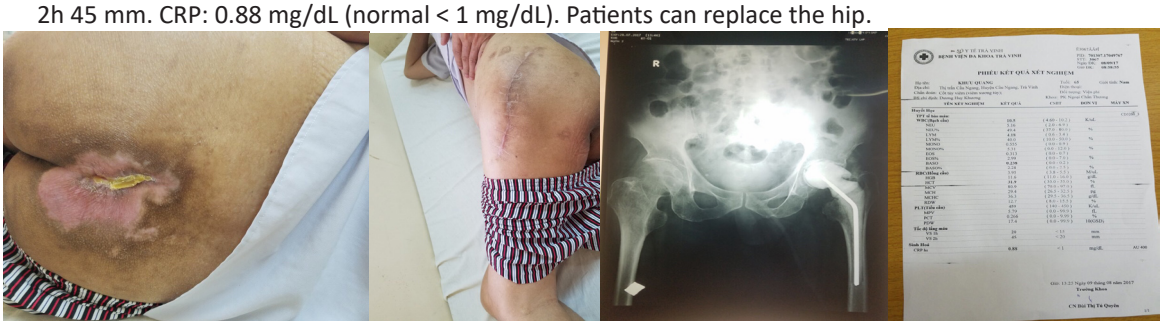
The patient was debrided, Synovial fluid tests, IM antibiotic and VAC. After 3 times to change VAC, this patient was debrirded again, he was added a PROTHTALAC which was made by cutom mold. The spacer component consists of: 02 packages of cement (40gr), 4 million units of Colistin + 4gr of vancomycin. Titanium core 5.5mm.



Result after 1 week: dry wound, WBC: 9.56 G/L, ESR: 1h: 66 mm, 2h 79 mm. CRP: 82.8mg/L



Results after 6 months of follow up: healing wounds, ulcer healing, WBC: 10.5 G/L, ESR: 1h: 20 mm, 2h 45 mm. CRP: 0.88 mg/dL (normal < 1 mg/dL). Patients can replace the hip.



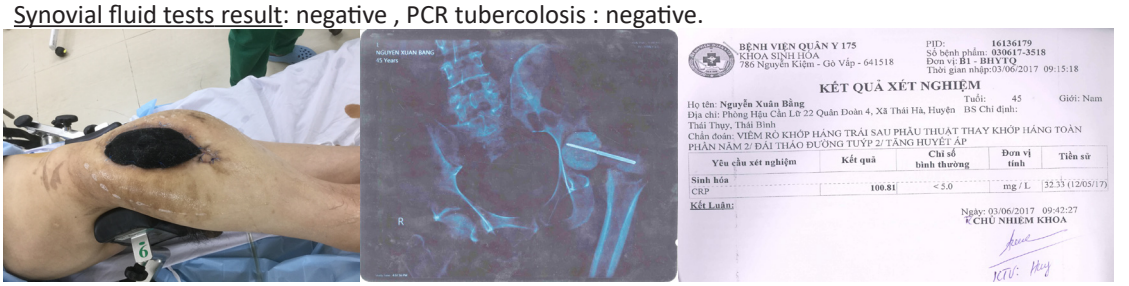
Case 5:

A male patient, 45 years old, he was a soldier, and lived in Thai Binh, Viet Nam.

In 2014, he got painful at the left hip, not release with pain-killer. In 2015, he has been addmitted to hospital suffering from avacular necrosis of left hip. Then he was operated total left hip replacement. Three weeks after the operation, he has got infectious left hip. Three months later, infection of left hip hasn't been downward, he has been transferred to Military 175 Hospital wih diagnosis: infection of left hip, hypertension, diabete, stiffness of the left knee.

Serological Tests: RBC: 5.27 T/L, WBC: 10.79 G/L (Neu: 54.4%), Glycemie 88 mg%, BUN: 2 mg/dL, Creatinin 1.5 mg/dL. SGOT: 32 U/L, SGPT: 22 U/L. ESR: 1h 42 mm, 2h 55 mm. CRP: 100.81 mg/L.

Synovial fluid tests result: negative , PCR tubercolosis : negative.



BỆNH VIỆN QUÂN Y 175
KHOA SINH HÓA
786 Nguyễn Kiệm - Gò Vấp - 641518

PID: 16136179
Số bệnh phẩm: 030617-3518
Đơn vị: B1 - BHYTQ
Thời gian nhập:03/06/2017 09:15:18

KẾT QUẢ XÉT NGHIỆM

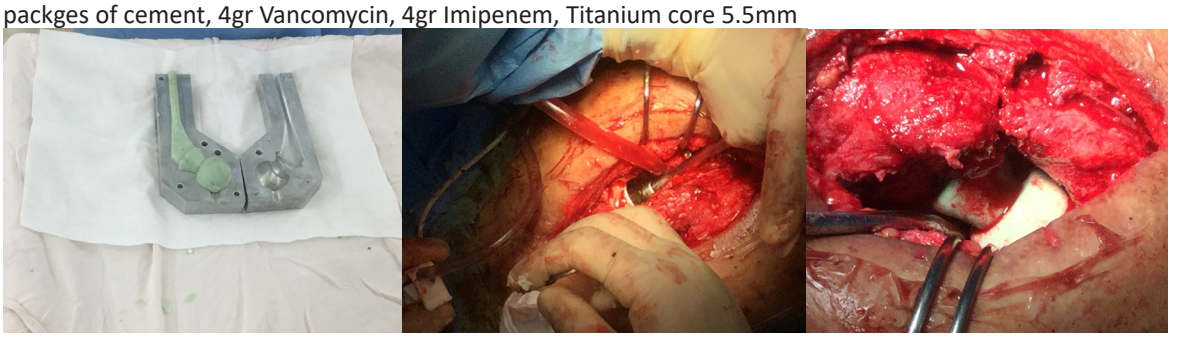
Họ tên: Nguyễn Xuân Bằng Tuổi: 45 Giới: Nam
Địa chỉ: Phòng Hậu Cần Lữ 22 Quân Đoàn 4, Xã Thái Hà, Huyện Thái Thụy, Thái Bình BS Chỉ định:
Chẩn đoán: VIÊM RỈ KHỚP HÁNG TRÁI SAU PHẪU THUẬT THAY KHỚP HÁNG TOÀN PHẦN NĂM 2/ ĐÁI THÁO ĐƯỜNG TUÝP 2/ TĂNG HUYẾT ÁP

Yêu cầu xét nghiệm	Kết quả	Chỉ số bình thường	Đơn vị tính	Tiền sử
Sinh hóa				
CRP	100.81	< 5.0	mg / L	32.33 (12/05/17)

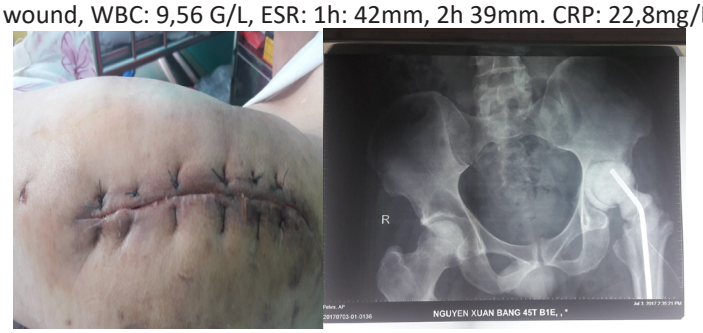
Kết Luận:

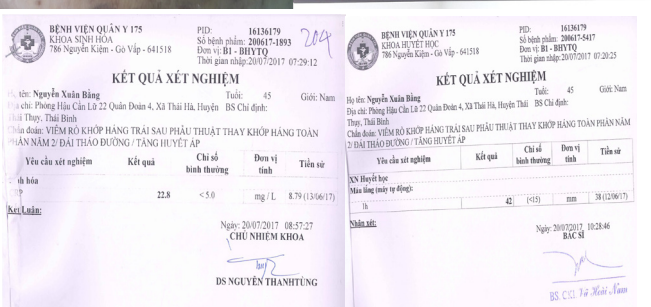
Ngày: 03/06/2017 09:42:27
T.CHỦ NHIỆM KHOA

Patient has been debrided with VAC, synovial fluid tests agian. After 3 times VAC drainage, this patient was operated to take PROSTALAC, with is made by cutom mold. The spacer component consists of: two packges of cement, 4gr Vancomycin, 4gr Imipenem, Titanium core 5.5mm



2 weeks later: dry wound, WBC: 9,56 G/L, ESR: 1h: 42mm, 2h 39mm. CRP: 22,8mg/L.





BỆNH VIỆN QUÂN Y 175
KHOA SINH HÓA
786 Nguyễn Kiệm - Gò Vấp - 641518

PID: 16136179
Số bệnh phẩm: 200617-1893
Đơn vị: B1 - BHYTQ
Thời gian nhập:20/07/2017 07:29:12

KẾT QUẢ XÉT NGHIỆM

Họ tên: Nguyễn Xuân Bằng Tuổi: 45 Giới: Nam
Địa chỉ: Phòng Hậu Cần Lữ 22 Quân Đoàn 4, Xã Thái Hà, Huyện Thái Thụy, Thái Bình BS Chỉ định:
Chẩn đoán: VIÊM RỈ KHỚP HÁNG TRÁI SAU PHẪU THUẬT THAY KHỚP HÁNG TOÀN PHẦN NĂM 2/ ĐÁI THÁO ĐƯỜNG / TĂNG HUYẾT ÁP

Yêu cầu xét nghiệm	Kết quả	Chỉ số bình thường	Đơn vị tính	Tiền sử
Sinh hóa				
CRP	22.8	< 5.0	mg / L	8.79 (13/06/17)

Kết Luận:

Ngày: 20/07/2017 08:57:27
CHỦ NHIỆM KHOA
DS NGUYỄN THANHTÙNG

BỆNH VIỆN QUÂN Y 175
KHOA HUYẾT HỌC
786 Nguyễn Kiệm - Gò Vấp - 641518

PID: 16136179
Số bệnh phẩm: 200617-5417
Đơn vị: B1 - BHYTQ
Thời gian nhập:20/07/2017 07:20:25

KẾT QUẢ XÉT NGHIỆM

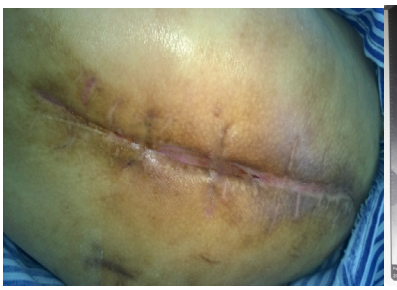
Họ tên: Nguyễn Xuân Bằng Tuổi: 45 Giới: Nam
Địa chỉ: Phòng Hậu Cần Lữ 22 Quân Đoàn 4, Xã Thái Hà, Huyện Thái Thụy, Thái Bình BS Chỉ định:
Chẩn đoán: VIÊM RỈ KHỚP HÁNG TRÁI SAU PHẪU THUẬT THAY KHỚP HÁNG TOÀN PHẦN NĂM 2/ ĐÁI THÁO ĐƯỜNG / TĂNG HUYẾT ÁP

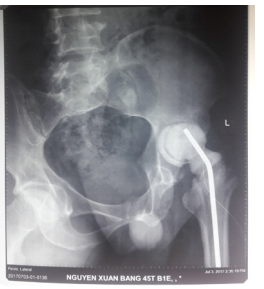
Yêu cầu xét nghiệm	Kết quả	Chỉ số bình thường	Đơn vị tính	Tiền sử
XN Huyết học				
Máu lắng (máy tự động):				
1h	42	(<15)	mm	38 (12/06/17)

Nhận xét:

Ngày: 20/07/2017 10:28:46
BÁC SĨ

2 months later, heaing wound, WBC: 10.5 G/L, ESR: 1h: 20 mm, 2h 14 mm. CRP: 3,22 mg/dL. The hip can be revision.





BỆNH VIỆN QUÂN Y 175
KHOA HUYẾT HỌC
786 Nguyễn Kiệm - Gò Vấp - 641518

PID: 16136179
Số bệnh phẩm: 240617-5559
Đơn vị: B1 - BHYTQ
Thời gian nhập: 24/08/2017 13:00:36

KẾT QUẢ XÉT NGHIỆM

Họ tên: **Nguyễn Xuân Bằng** Tuổi: 45 Giới: Nam
Địa chỉ: Phòng Hậu Cần Lữ 22 Quân Đoàn 4, Xã Thái Hà, Huyện Thái Thụy, Thái Bình BS Chỉ định:
Chẩn đoán: VIÊM RÒ KHỚP HÁNG TRÁI SAU PHẪU THUẬT THAY KHỚP HÁNG TOÀN PHẦN NĂM 2/ ĐÁI THÁO ĐƯỜNG / TĂNG HUYẾT ÁP

Yêu cầu xét nghiệm	Kết quả	Chỉ số bình thường	Đơn vị tính	Tiền sử
XN Huyết học				
Máu lắng (máy tự động):				
1h	**20**	(<15)	mm	42 (20/06/17)

Nhận xét:

Ngày: 24/08/2017 14:10:04
BÁC SĨ

BỆNH VIỆN QUÂN Y 175
KHOA SINH HÓA
786 Nguyễn Kiệm - Gò Vấp - 641518

PID: 16136179
Số bệnh phẩm: 240617-3041
Đơn vị: B1 - BHYTQ
Thời gian nhập: 24/08/2017 13:34:41

KẾT QUẢ XÉT NGHIỆM

Họ tên: **Nguyễn Xuân Bằng** Tuổi: 45 Giới: Nam
Địa chỉ: Phòng Hậu Cần Lữ 22 Quân Đoàn 4, Xã Thái Hà, Huyện Thái Thụy, Thái Bình BS Chỉ định:
Chẩn đoán: VIÊM RÒ KHỚP HÁNG TRÁI SAU PHẪU THUẬT THAY KHỚP HÁNG TOÀN PHẦN NĂM 2/ ĐÁI THÁO ĐƯỜNG / TĂNG HUYẾT ÁP

Yêu cầu xét nghiệm	Kết quả	Chỉ số bình thường	Đơn vị tính	Tiền sử
Sinh hóa				
CRP	3.22	< 5.0	mg / L	8.79 (13/06/17)

Kết Luận:

Ngày: 24/08/2017 15:04:29
CHỦ NHIỆM KHOA

CONCLUSION

In conclusion, not all PJIs are alike, but all share the biofilm mode of growth. This makes PJI hard to treat, but results reported in the literature have shown improvement over time up to a cure rate of 95%. Using a two-stage protocol generally gives better outcome than a one-stage procedure, although inadvertent one-stage treatment in low-grade PJI still yields acceptable results. We treat PJI using accurate microbiological diagnosis and treatment, debridement, local antiseptic and antibiotic treatment, monitoring the effect of treatment and redebridement to eradicate the biofilm infection. Having defined the various PJI treatment scenarios helps us to rapidly start optimal treatment, without having to wait for an exact definition of type of infection and, in time, causative organism or grade. We have used this approach for the past 1 year and have started to prospectively collect patient, infection and technical details in a revision cohort. This cohort is followed up using clinical as well as patient-reported outcome measures.

REFERENCES

1. Kurtz, S.M., et al., *Economic burden of periprosthetic joint infection in the United States.* J Arthroplasty, 2012. 27(8 Suppl): p. 61-5.e1.

2. Berend, K.R., et al., *Two-stage treatment of hip periprosthetic joint infection is associated with a high rate of infection control but high mortality.* Clin Orthop Relat Res, 2013. 471(2): p. 510-8.

3. Bozic, K.J. and M.D. Ries, *The impact of infection after total hip arthroplasty on hospital and surgeon resource utilization.* J Bone Joint Surg Am, 2005. 87(8): p. 1746-51.

4. Kurtz, S.M., et al., *Infection burden for hip and knee arthroplasty in the United States.* J Arthroplasty, 2008. 23(7): p. 984-91.

5. Anderson, D.J., et al., *Severe surgical site infection in community hospitals: epidemiology, key procedures, and the changing prevalence of methicillin-resistant Staphylococcus aureus.* Infect Control Hosp Epidemiol, 2007. 28(9): p. 1047-53.

6. Parvizi, J., et al., *Periprosthetic infection: are current treatment strategies adequate?* Acta orthopaedica Belgica, 2008. 74(6): p. 793-800.

7. Bradbury, T., et al., *The fate of acute methicillin-resistant Staphylococcus aureus periprosthetic knee infections treated by open debridement and retention of components.* J Arthroplasty, 2009. 24(6 Suppl): p. 101-4.

8. Parvizi, J., et al., *Periprosthetic infection due to resistant staphylococci: serious problems on the horizon.* Clin Orthop Relat Res, 2009. 467(7): p. 1732-9.

9. Tsukayama, D.T., R. Estrada, and R.B. Gustilo, *Infection after total hip arthroplasty. A study of the treatment of one hundred and six infections.* J Bone Joint Surg Am, 1996. 78(4): p. 512-23.

10. Zimmerli, W. and C. Moser, *Pathogenesis and treatment concepts of orthopaedic biofilm infections.* FEMS Immunol Med Microbiol, 2012. 65(2): p. 158-68.

11. Maderazo, E.G., S. Judson, and H. Pasternak, *Late infections of total joint prostheses. A review and recommendations for prevention.* Clin Orthop Relat Res, 1988(229): p. 131-42.

12. Moyad, T.F., T. Thornhill, and D. Estok, *Evaluation and management of the infected total hip and knee.* Orthopedics, 2008. 31(6): p. 581-8; quiz 589-90.

13. Toossi, N., et al., *Serum white blood cell count and differential do not have a role in the diagnosis of periprosthetic joint infection.* J Arthroplasty, 2012. 27(8 Suppl): p. 51-4.e1.

14. Spangehl, M.J., et al., *Prospective analysis of preoperative and intraoperative investigations for the diagnosis of infection at the sites of two hundred and two revision total hip arthroplasties.* J Bone Joint Surg Am, 1999. 81(5): p. 672-83.

15. Shih, L.Y., J.J. Wu, and D.J. Yang, *Erythrocyte sedimentation rate and C-reactive protein values in patients with total hip arthroplasty.* Clin Orthop Relat Res, 1987(225): p. 238-46.

16. Haaker, R., et al., *[Osteomyelitis after endoprostheses].* Orthopade, 2004. 33(4): p. 431-8.

17. Bedair, H., et al., *The Mark Coventry Award: diagnosis of early postoperative TKA infection using synovial fluid analysis.* Clin Orthop Relat Res, 2011. 469(1): p. 34-40.

18. Yi, P.H., et al., *The 2013 Frank Stinchfield Award: Diagnosis of infection in the early postoperative period after total hip arthroplasty.* Clin Orthop Relat Res, 2014. 472(2): p. 424-9.

19. Greidanus, N.V., et al., *Use of erythrocyte sedimentation rate and C-reactive protein level to diagnose infection before revision total knee arthroplasty. A prospective evaluation.* J Bone Joint Surg Am, 2007. 89(7): p. 1409-16.

20. Zajonz, D., et al., *Diagnostic work-up strategy for periprosthetic joint infections after total hip and knee arthroplasty: a 12-year experience on 320 consecutive cases.* Patient Saf Surg, 2015. 9.

21. Diaz-Ledezma, C., et al., *Diagnosis of periprosthetic joint infection in Medicare patients: multicriteria decision analysis.* Clin Orthop Relat Res, 2014. 472(11): p. 3275-84.

22. Parvizi, J. and C.J. Della Valle, *AAOS Clinical Practice Guideline: diagnosis and treatment of periprosthetic joint infections of the hip and knee.* J Am Acad Orthop Surg, 2010. **18(**12): p. 771-2.

23. Battaglia, M., et al., *Validity of preoperative ultrasound-guided aspiration in the revision of hip prosthesis.* Ultrasound Med Biol, 2011. 37(12): p. 1977-83.

24. Ali, F., et al., *Accuracy of joint aspiration for the preoperative diagnosis of infection in total hip arthroplasty.* J Arthroplasty, 2006. 21(2): p. 221-6.

25. Schmidt, R.M. and H.S. Rosenkranz, *Antimicrobial activity of local anesthetics: lidocaine and procaine.* J Infect Dis, 1970. 121(6): p. 597-607.

26. Della Valle, C., et al., *American Academy of Orthopaedic Surgeons clinical practice guideline on: the diagnosis of periprosthetic joint infections of the hip and knee.* J Bone Joint Surg Am, 2011. 93(14): p. 1355-7.

27. Font-Vizcarra, L., et al., *Blood culture flasks for culturing synovial fluid in prosthetic joint infections.* Clin Orthop Relat Res, 2010. 468(8): p. 2238-43.

28. Woods, G.L., *The mycobacteriology laboratory and new diagnostic techniques.* Infect Dis Clin North Am, 2002. 16(1): p. 127-44.

29. O'Shaughnessy, E.M., Y.M. Shea, and F.G. Witebsky, *Laboratory diagnosis of invasive mycoses.* Infect Dis Clin North Am, 2003. 17(1): p. 135-58.

30. Schafer, P., et al., *Prolonged bacterial culture to identify late periprosthetic joint infection: a promising strategy.* Clin Infect Dis, 2008. 47(11): p. 1403-9.

31. Tokarski, A.T., et al., *The routine use of atypical cultures in presumed aseptic revisions is unnecessary.* Clin Orthop Relat Res, 2013. 471(10): p. 3171-7.

32. Barrack, R.L., et al., *The Coventry Award. The value of preoperative aspiration before total knee revision.* Clin Orthop Relat Res, 1997(345): p. 8-16.

33. Parvizi, J., et al., *New definition for periprosthetic joint infection: from the Workgroup of the Musculoskeletal Infection Society.* Clin Orthop Relat Res, 2011. 469(11): p. 2992-4.

34. Parvizi, J., et al., *Diagnosis of periprosthetic joint infection: the utility of a simple yet unappreciated enzyme.* J Bone Joint Surg Am, 2011. 93(24): p. 2242-8.

35. Aggarwal, V.K., et al., *Leukocyte esterase from synovial fluid aspirate: a technical note.* J Arthroplasty, 2013. 28(1): p. 193-5.

36. Wetters, N.G., et al., *Leukocyte esterase reagent strips for the rapid diagnosis of periprosthetic joint infection.* J Arthroplasty, 2012. 27(8 Suppl): p. 8-11.

37. Cyteval, C., et al., *Painful infection at the site of hip prosthesis: CT imaging.* Radiology, 2002. 224(2): p. 477-83.

38. Talbot, B.S. and E.P. Weinberg, *MR Imaging with Metal-suppression Sequences for Evaluation of Total Joint Arthroplasty.* RadioGraphics, 2016. 36(1): p. 209-225.

39. Atkins, B.L., et al., *Prospective evaluation of criteria for microbiological diagnosis of prosthetic-joint infection at revision arthroplasty. The OSIRIS Collaborative Study Group.* J Clin Microbiol, 1998. 36(10): p. 2932-9.

40. Trampuz, A., et al., *Sonication of removed hip and knee prostheses for diagnosis of infection.* N Engl J Med, 2007. 357(7): p. 654-63.

41. Larsen, L.H., et al., *Optimizing culture methods for diagnosis of prosthetic joint infections: a summary of modifications and improvements reported since 1995.* J Med Microbiol, 2012. 61(Pt 3): p. 309-16.

42. Holleyman, R.J., et al., *Analysis of causative*

microorganism in 248 primary hip arthroplasties revised for infection: a study using the NJR dataset. Hip international : the journal of clinical and experimental research on hip pathology and therapy, 2016. 26(1): p. 82-89.

43. Kendoff, D. and T. Gehrke, *Surgical Management of Periprosthetic Joint Infection: One-Stage Exchange.* J Knee Surg, 2014. 27(04): p. 273-278.

44. Anagnostakos, K., et al., *Elution of gentamicin and vancomycin from polymethylmethacrylate beads and hip spacers in vivo.* Acta Orthop, 2009. 80(2): p. 193-7.

45. Holtom, P.D., et al., *Relation of surface area to in vitro elution characteristics of vancomycin-impregnated polymethylmethacrylate spacers.* Am J Orthop (Belle Mead NJ), 1998. 27(3): p. 207-10.

46. Zimmerli, W., A. Trampuz, and P.E. Ochsner, *Prosthetic-joint infections.* N Engl J Med, 2004. 351(16): p. 1645-54.