

Identyfikacja bezobjawowych zakażeń okołoprotezowych z zastosowaniem hodowli drobnoustrojów, sonikacji i sekwencjonowania genu 16S rRNA

Identification of asymptomatic periprosthetic infections using microbiological cultures, sonication and 16S rRNA gene sequencing



SAMODZIELNY PUBLICZNY
SZPITAL KLINICZNY NR 7
ŚLĄSKIEGO UNIwersYTETU
MEDYCZNEGO W KATOWICACH
Górnośląskie Centrum Medyczne
im. prof. Leszka Gieca



Międzynarodowy Portal Medyczny

Przemysław Bereza | Damian Kusz

Katedra i Klinika Ortopedii i Traumatologii Narządu Ruchu

Śląski Uniwersytet Medyczny w Katowicach

IMPLANT LOOSENING – the scale of the problem

Primary arthroplasty in Poland
THA and TKA (2016): 71 122
(base on raport of NFZ)

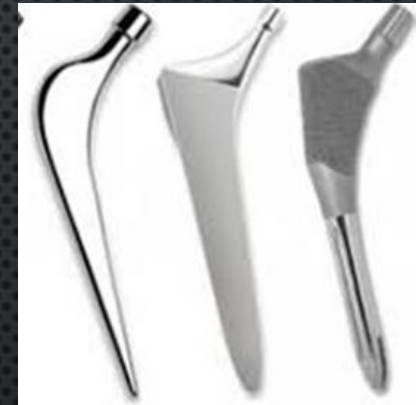
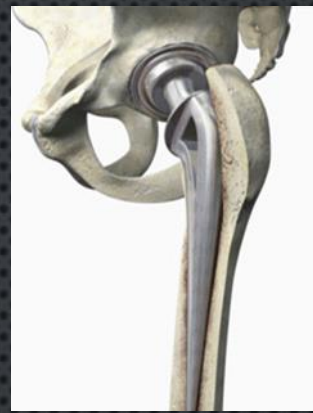
Revision arthroplasty:

9% hip revision
7% knee revision

PJI:

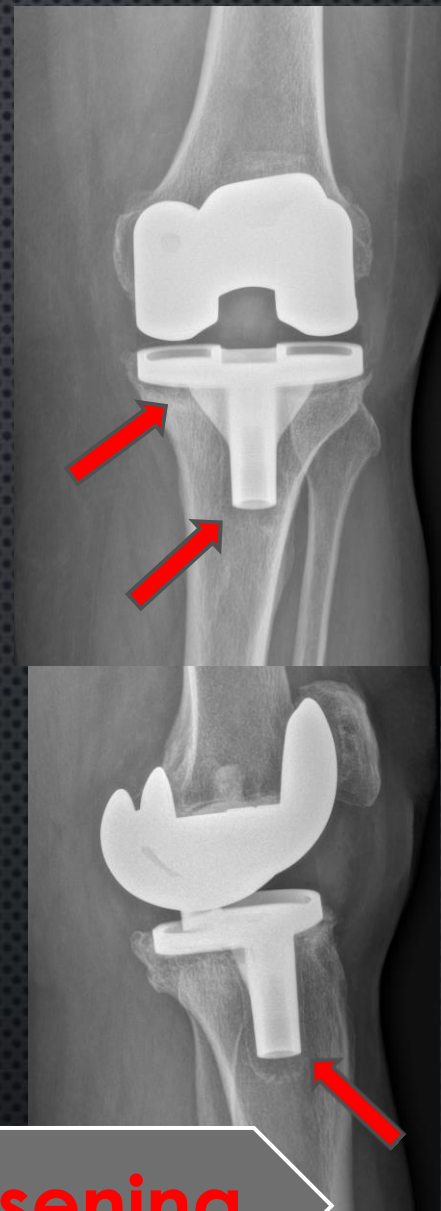
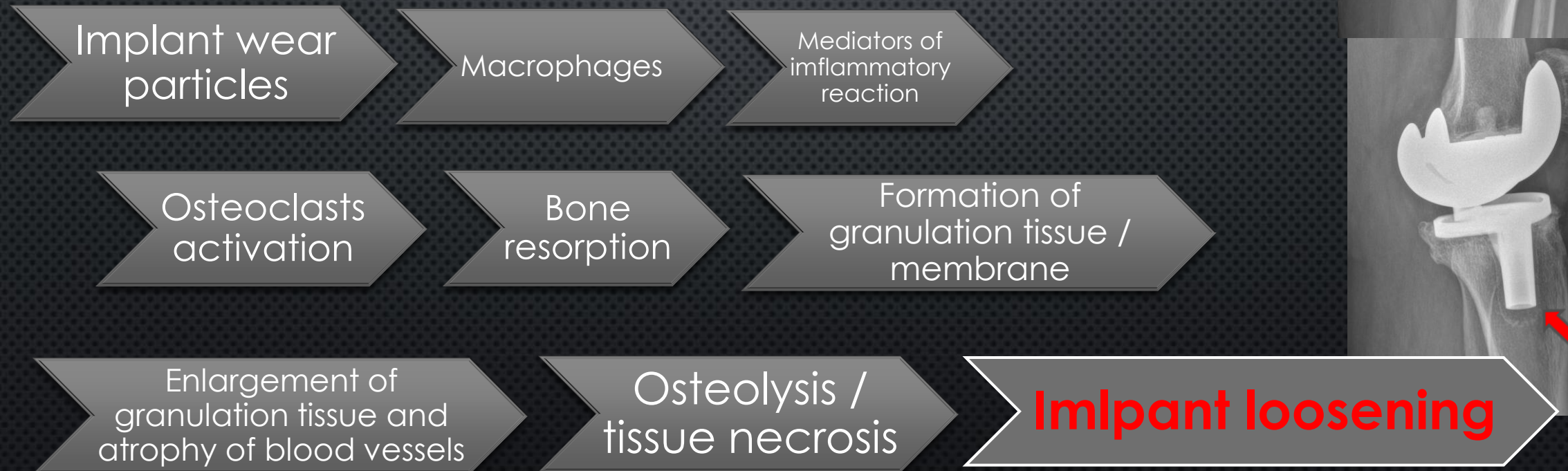
0.4 - 2,5% - after THA

1- 2% - after TKA



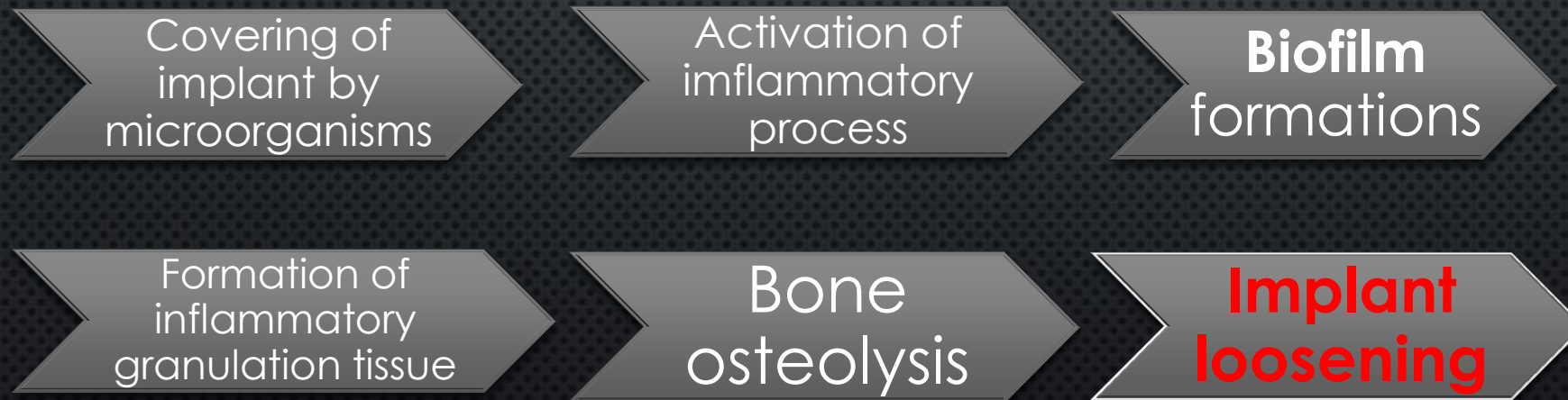
IMPLANT LOOSENING

ASEPTIC LOOSENING OF PROSTHESIS



IMPLANT LOOSENING

SEPTIC LOOSENING OF PROSTHESIS (PJI)



Definition of periprosthetic joint infection (PJI)

- two positive periprosthetic cultures with phenotypically identical organisms
- a sinus tract communicating with the joint

or when the results of laboratory studies meet at least 3 of 5 diagnostic criteria

- elevated serum CRP and ESR
- elevated synovial WBC count or ++ change on leukocyte esterase test strip
- elevated synovial fluid polymorphonuclear neutrophil percentage (PMN%)
- positive histological analysis of periprosthetic tissue
- a single positive culture

International Consensus on Periprosthetic Joint Infection

MusculoSkeletal Infection Society; MSIS; <http://www.msis-na.org/>

Hypothesis

Diagnosis of aseptic loosening of the prosthesis does not exclude the presence of bacteria on the surface of the prosthesis.

We postulate that a sonication procedure followed by PCR will improve bacterial identification in non-infected prosthetic joint loosening.

Bereza et al. *BMC Musculoskeletal Disorders* (2016) 17:138
DOI 10.1186/s12891-016-0991-1

BMC Musculoskeletal
Disorders

SURGICAL INFECTIONS
Volume 18, Number 5, 2017
© Mary Ann Liebert, Inc.
DOI: 10.1089/sur.2016.253

RESEARCH ARTICLE

Comparison of cultures and 16S rRNA sequencing for identification of bacteria in two-stage revision arthroplasties: preliminary report

Przemysław Bereza^{1*}, Alicja Ekiel², Aleksandra Auguściak-Duma³, Małgorzata Apte², Piotr Wojciechowski¹, Aleksander L. Sieroń³ and Gayane Martirosian^{2,4}

Identification of Asymptomatic Prosthetic Joint Infection: Microbiologic and Operative Treatment Outcomes

Przemysław L. Bereza,¹ Alicja Ekiel,² Aleksandra Auguściak-Duma,³ Małgorzata Apte², Iwona Wilk,² Piotr Wojciechowski,¹ Damian J. Kusz,¹ and Gayane Martirosian^{2,4}

International Orthopaedics (SICOT)
DOI 10.1007/s00264-013-1955-9

ORIGINAL PAPER

Identification of silent prosthetic joint infection: preliminary report of a prospective controlled study

Przemysław L. Bereza · Alicja Ekiel · Aleksandra Auguściak-Duma · Małgorzata Apte² · Iwona Wilk · Damian J. Kusz · Piotr Wojciechowski · Gayane Martirosian

Received: 21 April 2013 / Accepted: 22 May 2013
© The Author(s) 2013. This article is published with open access at Springerlink.com

Main goals of the study

1

This prospective study was designed to investigate the microbiologic cultures of joint aspiration fluid and intraoperative tissue specimens and to compare the outcomes with sonication fluid cultures in cases supposed pre-operatively to be either aseptic loosening or presumed PJI.

Main goals of the study

2

Assessment of factors that may increase the risk of loosening elements of joint endoprostheses such as: abnormal body weight, concomitant diseases, previous surgical procedures performed on the examined joints and other operations.

3

Analysis of the impact of body weight and duration of endoprosthesis (endoprosthesis survival) on implant loosening.

Materials and methods

Inclusion criteria:

patients with aseptic hip or knee prosthesis loosening or presumed PJI , who present: clinical signs of prosthesis loosening, radiologic features of loosened implants, normal or elevated concentrations of serum laboratory markers of infection (CRP, ESR, WBC), if there was a lack of or insufficient liquid volume recovered by pre-operative joint aspiration

Exclusion criteria:

signs or symptoms of infection (local inflammatory signs, sinus tract, or systemic symptoms of infection), antibiotic administration two weeks before revision arthroplasty, rheumatoid arthritis, immunosuppression or chemotherapy, and lack of patient consent for participation in the study

Materials and methods

- laboratory markers (serum indicator of infection: WBC, ESR, CRP)
- preoperative culture of synovial fluid from joint aspiration
- intraoperative tissue cultures

- **sonification of removed, loosened implants:**

 - cultures of sonication liquid

 - molecular techniques: 16S rRNA sequencing

in cases of negative culture results

- histopathological analysis of periprostheses tissues and membrane on implants (Krenn and Morawietz classification:

type I periprosthetic membrane (ppm) of the wear particle-induced type
type II ppm of the infectious type
type III ppm of the combined type
type IV indeterminate type

Materials and methods

Characteristic of treated patients:

- 37 patients (21 women i 16 men)
- Age: 66.1 y/o (39-81 y/o)
- Operated joints: 30 hips
7 knees
- Time to loosening 110 mos (3-336 mos); ca. 9 y

Patient	Culture			Systemic inflammatory markers		Type of prostheses	Age of implant (mos)	Operative procedure	Type of failure
	Joint fluid	Intra-operative specimens				UC			
1	<i>S. aureus</i>	<i>S. aureus</i>					3	Spacer	P-atb
2	<i>S. aureus</i>	<i>S. aureus</i>					6	Spacer	Arthrodesis
3	<i>E. cloacae</i>	<i>S. epidermidis, S. hominis</i>					40	Spacer	None
4	<i>E. cloacae</i>	<i>S. epidermidis, S. hominis</i>	<i>E. cloacae</i>	N	N	+	40	Partial exchange	None
5	<i>S. hominis</i>	No organism	<i>S. hominis, R. pickettii</i>	18.6	N	+	36	Spacer	None
6	No organism	<i>E. faecalis</i>	<i>E. faecalis</i>	N	N		48	Partial exchange	None
7	No organism	<i>S. epidermidis</i>	<i>S. epidermidis</i>	N	N		230	Partial exchange	Pih, P-atb
8	No organism	<i>S. epidermidis</i>	No organism	N	N	+	168	Spacer	None
9	No organism	No organism	No organism	N	N		26	Spacer	None
10	No organism	No organism	No organism	N	N		26	Partial exchange	None
11	No organism	No organism	No organism	N	N		26	Partial exchange	None
12	No organism	No organism	No organism	N	N		26	Partial exchange	None
13	<i>S. epidermidis</i>	No organism	No organism	N	N		26	Partial exchange	None
14	No organism	No organism	No organism	N	N		26	Partial exchange	None
15	No organism	No organism	No organism	N	N		26	Partial exchange	P-atb
16	No organism	No organism	No organism	N	N		26	Partial exchange	Pih, P-atb
17	No organism	No organism	No organism	N	N		26	Partial exchange	None
18	No organism	No organism	No organism	N	N		26	Partial exchange	None
19	No organism	No organism	No organism	N	N		26	Partial exchange	None
20	No organism	No organism	No organism	N	N		26	Partial exchange	None
21	No organism	No organism	No organism	N	N		26	Partial exchange	Pih, P-atb
22	No organism	No organism	No organism	N	N		26	Partial exchange	Pih, P-atb
23	No organism	No organism	No organism	N	N		26	Partial exchange	None
24	No organism	No organism	No organism	N	N		26	Partial exchange	None
25	No organism	No organism	No organism	N	N		26	Partial exchange	None
26	No organism	No organism	No organism	N	N		26	Partial exchange	None
27	No organism	No organism	No organism	N	N		26	Partial exchange	None
28	No organism	No organism	No organism	N	N		26	Partial exchange	None
29	No organism	No organism	No organism	N	N		26	Partial exchange	None
30	No organism	No organism	No organism	N	N		26	Partial exchange	None
31	No organism	No organism	No organism	N	N		26	Partial exchange	None
32	No organism	No organism	No organism	N	N		26	Partial exchange	None
33	No organism	No organism	No organism	N	N		26	Spacer	None
34	No organism	No organism	No organism	N	N	+	138	Partial exchange	None
35	No organism	No organism	No organism	N	N		276	Partial exchange	Pih, P-atb
36	No organism	No organism	No organism	N	N	+	132	Partial exchange	None
37	No organism	No organism	No organism	N	N	+	192	Spacer	None

Results

The higher concentration of CRP (>10 mg/L) was common in patients with bacterial growth in the sonicate fluid (*S. epidermidis* in one case) or in synovial liquid or intra-operative specimens. ($p=0.005$)

The five patients with significantly elevated concentrations of CRP (but with no obvious local or general infection) were strongly suspected of having PJI.

Patient	Culture		Systemic inflammatory markers		Type of prostheses	Age of implant (mos)	Operative procedure	Type of failure
	Joint fluid	Intra-operative specimens			UC			
1	<i>S. aureus</i>	<i>S. aureus</i>				3	Spacer	P-atb
2	<i>S. aureus</i>	<i>S. aureus</i>				6	Spacer	Arthrodesis
3	<i>E. cloacae</i>	<i>S. epidermidis, S. hominis</i>				40	Spacer	None
4	<i>E. cloacae</i>	<i>S. epidermidis, S. hominis</i>	<i>E. cloacae</i>	N	N	40	Partial exchange	None
5	<i>S. hominis</i>	No organism	<i>S. hominis, R. pickettii</i>	18.6	N	36	Spacer	None
6	No organism	<i>E. faecalis</i>	<i>E. faecalis</i>	N	N	48	Partial exchange	None
7	No organism	<i>S. epidermidis</i>	<i>S. epidermidis</i>	N	N	230	Partial exchange	Pih, P-atb
8	No organism	<i>S. epidermidis</i>	No organism	N	N	168	Spacer	None
9	No organism	No organism	<i>S. epidermidis</i>	18	15.6	96	Spacer	None
10	No organism	No organism	<i>R. pickettii</i>	N	N	164	Total exchange	None
11	No organism	No organism	<i>R. pickettii</i>	N	N	132	Total exchange	None
12	No organism	No organism	<i>R. pickettii</i>	N	11.3	120	Total exchange	None
13	<i>S. epidermidis</i>	No organism	No organism	N	N	156	Partial exchange	None
14	No organism	No organism	No organism	N	N	17	Spacer	None
15	No organism	No organism	No organism	N	N	84	Spacer	P-atb
16	No organism	No organism	No organism	N	N	50	Spacer	Pih, P-atb
17	No organism	No organism	No organism	N	N	6	Total exchange	None
18	No organism	No organism	No organism	N	N	168	Total exchange	None
19	No organism	No organism	No organism	N	N	108	Total exchange	None
20	No organism	No organism	No organism	N	N	96	Partial exchange	None
21	No organism	No organism	No organism	N	N	240	Total exchange	Pih, P-atb
22	No organism	No organism	No organism	N	N	120	Total exchange	Pih, P-atb
23	No organism	No organism	No organism	N	N	109	Partial exchange	None
24	No organism	No organism	No organism	N	N	132	Partial exchange	None
25	No organism	No organism	No organism	N	N	45	Spacer	None
26	No organism	No organism	No organism	N	N	120	Partial exchange	None
27	No organism	No organism	No organism	N	N	96	Partial exchange	None
28	No organism	No organism	No organism	N	N	98	Partial exchange	None
29	No organism	No organism	No organism	N	N	225	Partial exchange	None
30	No organism	No organism	No organism	N	N	90	Total exchange	None
31	No organism	No organism	No organism	N	N	24	Total exchange	None
32	No organism	No organism	No organism	N	N	140	Partial exchange	None
33	No organism	No organism	No organism	N	N	124	Spacer	None
34	No organism	No organism	No organism	N	N	138	Partial exchange	None
35	No organism	No organism	No organism	N	N	276	Partial exchange	Pih, P-atb
36	No organism	No organism	No organism	N	N	132	Partial exchange	None
37	No organism	No organism	No organism	N	N	192	Spacer	None

Results

Joint liquid
 Positive culture
16.2%

C=cemented; CRP=C-reactive protein; N=normal value (CRP: N<10 mg/L; WBC: N<10,000/mm³); P-atb – prolonged antibiotic therapy, Pih=prolonged incision healing; UC=uncemented; WBC=white blood cell

Patient	Culture			Systemic inflammatory markers		Type of prostheses		Age of implant (mos)	Operative procedure	Type of failure
	Joint fluid	Intra-operative specimens	Sonicate	CRP	WBC	C	UC			
1	<i>S. aureus</i>	<i>S. aureus</i>	<i>S. aureus</i>	93.4	N	+		3	Spacer	P-atb
2	<i>S. aureus</i>	<i>S. aureus</i>	<i>S. aureus</i>	32.5	N	+		6	Spacer	Arthrodesis
3	<i>E. cloacae</i>	<i>S. epidermidis, S. hominis</i>	<i>E. cloacae</i>	39	N	+		40	Spacer	None
4	<i>E. cloacae</i>	<i>S. epidermidis, S. hominis</i>	<i>E. cloacae</i>	N	N	+		40	Partial exchange	None
5	<i>S. hominis</i>	No organism	<i>S. hominis, R. pickettii</i>	18.6	N	+		36	Spacer	None
6	No organism	<i>E. faecalis</i>	<i>E. faecalis</i>	N	N		+	48	Partial exchange	None
7	No organism	<i>S. epidermidis</i>	<i>S. epidermidis</i>	N	N		+	230	Partial exchange	Pih, P-atb
8	No organism	<i>S. epidermidis</i>	No organism	N	N	+		168	Spacer	None
9	No organism	No organism	<i>S. epidermidis</i>	18	15.6	+		96	Spacer	None
10	No organism	No organism	<i>R. pickettii</i>	N	N	+		164	Total exchange	None
11	No organism	No organism	<i>R. pickettii</i>	N	N	+		132	Total exchange	None
12	No organism	No organism	<i>R. pickettii</i>	N	11.3	+		120	Total exchange	None
13	<i>S. epidermidis</i>	No organism	No organism	N	N	+		156	Partial exchange	None
14	No organism	No organism	No organism	N	N	+		17	Spacer	None
15	No organism	No organism	No organism	N	N	+		84	Spacer	P-atb
16	No organism	No organism	No organism	N	N	+		50	Spacer	Pih, P-atb
17	No organism	No organism	No organism	N	N	+		6	Total exchange	None
18	No organism	No organism	No organism	N	N	+		168	Total exchange	None
19	No organism	No organism	No organism	N	N	+		108	Total exchange	None
20	No organism	No organism	No organism	N	N	+		96	Partial exchange	None
21	No organism	No organism	No organism	N	N	+		240	Total exchange	Pih, P-atb
22	No organism	No organism	No organism	N	N	+		120	Total exchange	Pih, P-atb
23	No organism	No organism	No organism	N	N		+	109	Partial exchange	None
24	No organism	No organism	No organism	N	N		+	132	Partial exchange	None
25	No organism	No organism	No organism	N	N	+		45	Spacer	None
26	No organism	No organism	No organism	N	N		+	120	Partial exchange	None
27	No organism	No organism	No organism	N	N	+		96	Partial exchange	None
28	No organism	No organism	No organism	N	N	+		98	Partial exchange	None
29	No organism	No organism	No organism	N	N		+	225	Partial exchange	None
30	No organism	No organism	No organism	N	N	+		90	Total exchange	None
31	No organism	No organism	No organism	N	N	+		24	Total exchange	None
32	No organism	No organism	No organism	N	N		+	140	Partial exchange	None
33	No organism	No organism	No organism	N	N	+		124	Spacer	None
34	No organism	No organism	No organism	N	N		+	138	Partial exchange	None
35	No organism	No organism	No organism	N	N		+	276	Partial exchange	Pih, P-atb
36	No organism	No organism	No organism	N	N	+		132	Partial exchange	None
37	No organism	No organism	No organism	N	N	+		192	Spacer	None

Intraoperative specimens
Positive culture
18.9%

Joint liquid
Positive culture
16.2%

C=cemented; CRP=C-reactive protein; N=normal value (CRP: N<10 mg/L; WBC: N<10,000/mm³); P-atb – prolonged antibiotic therapy, Pih = prolonged incision healing; UC = uncemented; WBC=white blood cell

Patient	Culture		Systemic inflammatory markers		Type of prostheses		Age of implant (mos)	Operative procedure	Type of failure	
	Joint fluid	Intra-operative specimens	Sonicate	CRP	WBC	C				UC
1	<i>S. aureus</i>	<i>S. aureus</i>			N		+	3	Spacer	P-atb
2	<i>S. aureus</i>	<i>S. aureus</i>			N		+	6	Spacer	Arthrodesis
3	<i>E. cloacae</i>	<i>S. epidermidis, S. hominis</i>			N		+	40	Spacer	None
4	<i>E. cloacae</i>	<i>S. epidermidis, S. hominis</i>			N		+	40	Partial exchange	None
5	<i>S. hominis</i>	No organism			N		+	36	Spacer	None
6	No organism	<i>E. faecalis</i>			N			48	Partial exchange	None
7	No organism	<i>S. epidermidis</i>			N		+	230	Partial exchange	Pih, P-atb
8	No organism	<i>S. epidermidis</i>			N		+	168	Spacer	None
9	No organism	No organism			15.6		+	96	Spacer	None
10	No organism	No organism			N		+	164	Total exchange	None
11	No organism	No organism			N		+	132	Total exchange	None
12	No organism	No organism			11.3		+	120	Total exchange	None
13	<i>S. epidermidis</i>	No organism			N		+	156	Partial exchange	None
14	No organism	No organism			N		+	17	Spacer	None
15	No organism	No organism			N		+	84	Spacer	P-atb
16	No organism	No organism			N		+	50	Spacer	Pih, P-atb
17	No organism	No organism			N		+	6	Total exchange	None
18	No organism	No organism			N		+	168	Total exchange	None
19	No organism	No organism			N		+	108	Total exchange	None
20	No organism	No organism			N		+	96	Partial exchange	None
21	No organism	No organism			N		+	240	Total exchange	Pih, P-atb
22	No organism	No organism			N		+	120	Total exchange	Pih, P-atb
23	No organism	No organism			N			109	Partial exchange	None
24	No organism	No organism			N			132	Partial exchange	None
25	No organism	No organism			N		+	45	Spacer	None
26	No organism	No organism			N			120	Partial exchange	None
27	No organism	No organism			N		+	96	Partial exchange	None
28	No organism	No organism			N		+	98	Partial exchange	None
29	No organism	No organism			N			225	Partial exchange	None
30	No organism	No organism			N		+	90	Total exchange	None
31	No organism	No organism			N		+	24	Total exchange	None
32	No organism	No organism			N			140	Partial exchange	None
33	No organism	No organism			N		+	124	Spacer	None
34	No organism	No organism			N			138	Partial exchange	None
35	No organism	No organism			N		+	276	Partial exchange	Pih, P-atb
36	No organism	No organism			N		+	132	Partial exchange	None
37	No organism	No organism			N		+	192	Spacer	None

Sonication
Positive culture
29.7%

Intraoperative specimens
Positive culture
18.9%

Joint liquid
Positive culture
16.2%

C=cemented; CRP=C-reactive protein; N=normal value (CRP: N<10 mg/L; WBC: N<10,000/mm³); P-atb – prolonged antibiotic therapy, Pih=prolonged incision healing; UC=uncemented; WBC=white blood cell

Patient	Culture		Systemic inflammatory markers		Type of prostheses		Age of implant (mos)	Operative procedure	Type of failure	
	Joint fluid	Intra-operative specimens	Sonicate	CRP	WBC	C				UC
1	<i>S. aureus</i>	<i>S. aureus</i>			N	+		3	Spacer	P-atb
2	<i>S. aureus</i>	<i>S. aureus</i>			N	+		6	Spacer	Arthrodesis
3	<i>E. cloacae</i>	<i>S. epidermidis, S. hominis</i>			N	+		40	Spacer	None
4	<i>E. cloacae</i>	<i>S. epidermidis, S. hominis</i>			N	+		40	Partial exchange	None
5	<i>S. hominis</i>	No organism			N	+		36	Spacer	None
6	No organism	<i>E. faecalis</i>			N		+	48	Partial exchange	None
7	No organism	<i>S. epidermidis</i>			N		+	230	Partial exchange	Pih, P-atb
8	No organism	<i>S. epidermidis</i>			N	+		168	Spacer	None
9	No organism	No organism			15.6	+		96	Spacer	None
10	No organism	No organism			N	+		164	Total exchange	None
11	No organism	No organism			N	+		132	Total exchange	None
12	No organism	No organism			11.3	+		120	Total exchange	None
13	<i>S. epidermidis</i>	No organism			N	+		156	Partial exchange	None
14	No organism	No organism			N					
15	No organism	No organism			N					
16	No organism	No organism			N					
17	No organism	No organism			N					
18	No organism	No organism			N					
19	No organism	No organism			N					
20	No organism	No organism			N					
21	No organism	No organism			N					
22	No organism	No organism			N					
23	No organism	No organism			N					
24	No organism	No organism			N					
25	No organism	No organism			N					
26	No organism	No organism			N					
27	No organism	No organism			N					
28	No organism	No organism			N					
29	No organism	No organism			N					
30	No organism	No organism			N					
31	No organism	No organism			N					
32	No organism	No organism			N					
33	No organism	No organism			N					
34	No organism	No organism			N					
35	No organism	No organism			N					
36	No organism	No organism			N					
37	No organism	No organism			N	+		192	Spacer	None

Sonication
Positive culture
29.7%

Intraoperative specimens
Positive culture
18.9%

Joint liquid
Positive culture
16.2%

Sequencing results

- a large variety of bacteria in each cases.
- the most frequent isolate was CNS and other representatives of human and environmental microflora

C=cemented; CRP=C-reactive protein; N=normal value (CRP: N<10 mg/L; WBC: N<10,000/mm³); P-atb – prolonged antibiotic therapy, Pih=prolonged incision healing; UC=uncemented; WBC=white blood cell

Patient	Culture			Systemic inflammatory markers		Type of prostheses		Age of implant (mos)	Operative procedure	Type of failure
	Joint fluid	Intra-operative specimens	Sonicate	CRP	WBC	C	UC			
1	<i>S. aureus</i>	<i>S. aureus</i>	<i>S. aureus</i>	93.4	N	+		3	Spacer	P-atb
2	<i>S. aureus</i>	<i>S. aureus</i>	<i>S. aureus</i>	32.5	N	+		6	Spacer	Arthrodesis
3	<i>E. cloacae</i>	<i>S. epidermidis, S. hominis</i>	<i>E. cloacae</i>	39	N	+		40	Spacer	None
4	<i>E. cloacae</i>	<i>S. epidermidis, S. hominis</i>	<i>E. cloacae</i>	N	N	+		40	Partial exchange	None
5	<i>S. hominis</i>	No organism	<i>S. hominis, R. pickettii</i>	18.6	N	+		36	Spacer	None
6	No organism	<i>E. faecalis</i>	<i>E. faecalis</i>	N	N		+	48	Partial exchange	None
7	No organism	<i>S. epidermidis</i>	<i>S. epidermidis</i>	N	N		+	230	Partial exchange	Pih, P-atb
8	No organism	<i>S. epidermidis</i>	No organism	N	N	+		168	Spacer	None
9	No organism	No organism	No organism	N	N			76	Spacer	None
10	No organism	No organism	No organism	N	N			76	Total exchange	None
11	No organism	No organism	No organism	N	N			76	Total exchange	None
12	No organism	No organism	No organism	N	N			76	Total exchange	None
13	<i>S. epidermidis</i>	No organism	No organism	N	N			76	Partial exchange	None
14	No organism	No organism	No organism	N	N			76	Spacer	None
15	No organism	No organism	No organism	N	N			76	Spacer	P-atb
16	No organism	No organism	No organism	N	N			76	Spacer	Pih, P-atb
17	No organism	No organism	No organism	N	N			76	Total exchange	None
18	No organism	No organism	No organism	N	N			76	Total exchange	None
19	No organism	No organism	No organism	N	N			76	Total exchange	None
20	No organism	No organism	No organism	N	N			76	Partial exchange	None
21	No organism	No organism	No organism	N	N			76	Total exchange	Pih, P-atb
22	No organism	No organism	No organism	N	N			76	Total exchange	Pih, P-atb
23	No organism	No organism	No organism	N	N			76	Partial exchange	None
24	No organism	No organism	No organism	N	N		+	132	Partial exchange	None
25	No organism	No organism	No organism	N	N	+		45	Spacer	None
26	No organism	No organism	No organism	N	N		+	120	Partial exchange	None
27	No organism	No organism	No organism	N	N	+		96	Partial exchange	None
28	No organism	No organism	No organism	N	N	+		98	Partial exchange	None
29	No organism	No organism	No organism	N	N		+	225	Partial exchange	None
30	No organism	No organism	No organism	N	N	+		90	Total exchange	None
31	No organism	No organism	No organism	N	N	+		24	Total exchange	None
32	No organism	No organism	No organism	N	N		+	140	Partial exchange	None
33	No organism	No organism	No organism	N	N	+		124	Spacer	None
34	No organism	No organism	No organism	N	N		+	138	Partial exchange	None
35	No organism	No organism	No organism	N	N		+	276	Partial exchange	Pih, P-atb
36	No organism	No organism	No organism	N	N	+		132	Partial exchange	None
37	No organism	No organism	No organism	N	N	+		192	Spacer	None

Percentage of identified pathogens after sonication in comparison to standard microbiological cultures:

35.1% vs 24.3%

Results

The outcomes of histopathologic tests of peri-prosthetic tissues

- infection type II - **in all culture-positive** joints
(patients no 1-8) $p=0.004$
- infection type II - in **41.4%** of the cases with
negative culture results

type I periprosthetic membrane (ppm) of
the wear particle-induced type
type II ppm of the infectious type
type III ppm of the combined type
type IV indeterminate type

Results

Loosening of implants was noted more often in patients with:

- BMI > 25 (overweight and obese) and
- negative cultures results

than in the group of patients with positive culture result.

82.8% vs **62.5%**

(24/29)

(5/8)

(correlation was not statistically significant)

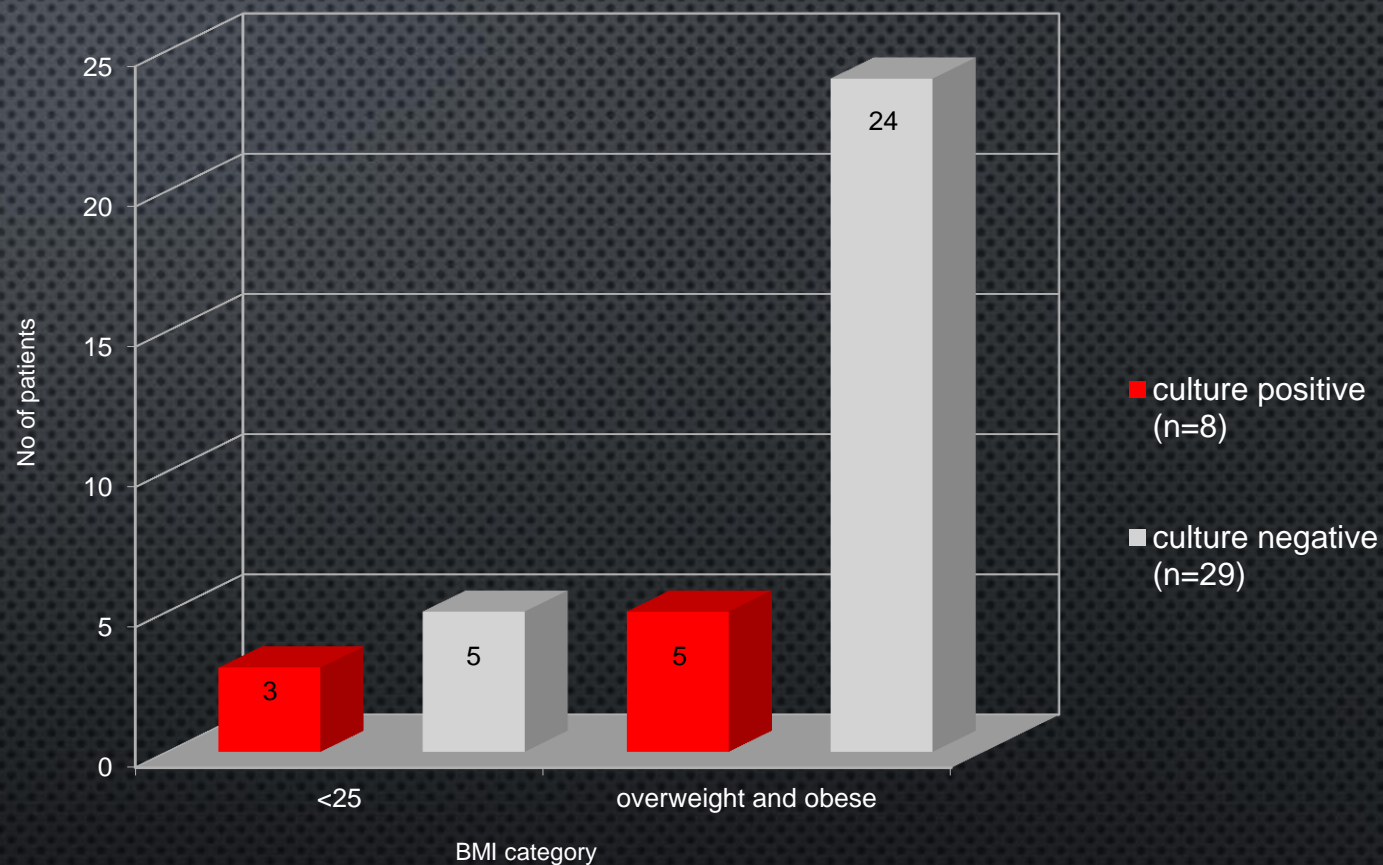


FIG. The distribution of BMI in group of patients with positive (n = 8) and negative (n = 29) culture results.

Results

- **Previous orthopaedic operations** (not only of the examined joints) and
- **Cardiac diseases** (mostly ischemic heart disease)

were significantly more common in patients with positive cultures results.

(p=0.04)

Comorbidities:	
Cardiac diseases	19/37 (51%)
Previous operations	15/37 (40%)
Previous other joints replacement	13/37 (35%)
Digestive diseases	10/37 (27%)
Previous operation of the affected joint	8/37 (22%)
Previous revision surgeries of the joint(s)	7/37 (19%)
Thyroid disease (hyperthyroidism)	6/37 (16%)
Diabetes melitus	4/37 (11%)
Nicotine addiction	4/37 (11%)
Respiratory system diseases	3/37 (8%)
Arthropaties	3/37 (8%)

Results

- Implant loosening < 24 months
 - in 25% of patients with positive culture results (2/8)
 - in 10.3% patients with aseptic (3/29)
- Implant loosening < 6 months
 - in 25% (2/8)
 - 3,5% (1/29)

Some authors have proved a correlation between prosthesis age and failure risk, in that **early loosening is more frequently caused by hidden PJI than is late loosening** (>24 mos), 40% vs. 22%, respectively

Results

Table. Complications in Relation to Type of Primary Arthroplasty and Revision Procedure

<i>Treated joint and implant</i>	<i>N (%)</i>	<i>Type of revision surgery for loosened implant</i>	<i>Failures at two-year followup</i>	<i>Culture results</i>	
				<i>Positive</i>	<i>Negative</i>
Hip	30 (81)		6	2	4
Cemented	21 (70)	6 partial revisions 10 total revisions 5 spacers	1 2 1	1 (case 4) –	– 2 (cases 21 and 22) 1 (case 16)
Non-cemented					
Press-fit	5 (16)	5 partial revisions	2	1 (case 7)	1 (case 35)
Screwable cup	4 (13)	4 partial revisions	–	–	–
Knee	7 (19)	7 spacers	3	2 (cases 1 and 2)	1 (case 15)

Results

- **ONE-STAGE ARTHROPLASTY:**

- performed in most patients with pre-operative diagnosis of aseptic loosening : 67% (25/37)
- performed in **76% (22/29) culture negative patients:**
 - partial exchange : 41% (12/29)**
 - total exchange : 35% (10/29)**

- **TWO-STAGES ARTHROPLASTY**

- performed in 12 cases of the entire series; in all patients with **PJI highly suspected** because of significant elevated CRP
- in **63% patients (5/8)** with **positive culture**
- in **24% of culture-negative patients** with probable peri-prosthetic infection.

Results

Two years' follow-up:

- 9 failures (prolonged antibiotics administration caused by impaired wound healing)
 - **The complications were more frequent in patients with positive** than with negative cultures, 50% and 17.2%, respectively ($p = 0.08$).
 - **The complications were more frequent in patients operated with 2-stage procedure**
 - **Failures were observed in 42.8% of the treated knees
20% of the treated hips**
-

In two cases of likely PJI, the patients required **re-operation**:

- 1st case (patient no. 1): prolonged antibiotic therapy as well as surgery - resurfacing of the patella
- it was not considered a failure
- 2nd case (patient no. 2): finally underwent arthrodesis of the knee because of
the general medical condition and the high risk of re-infection

Conclusions

Conclusion 1.

We found micro-organisms on the surface of implants removed because of clinical features of aseptic loosening of prosthesis. Inclusion of the sonication procedure in the diagnostic algorithm of prostheses loosening increases the ability to identify pathogens.

Conclusion 2.

Previous operations and heart disease are more common than other co-morbidities and probably have a greater influence on implant loosening.

Conclusions

Conclusion 3.

The results of this study suggest the co-existing roles of the BMI and the period to implant loosening as well as biologic agents in process of prostheses loosening.

Conclusion 4.

Our analysis proved better outcomes of operative treatment of aseptic loosening and presumed PJI using one-stage operations than two-stage revision arthroplasty.

THANK YOU FOR ATTENTION!



SAMODZIELNY PUBLICZNY
SZPITAL KLINICZNY NR 7
ŚLĄSKIEGO UNIwersYTETU
MEDYCZNEGO W KATOWICACH
Górnośląskie Centrum Medyczne
im. prof. Leszka Gieca



Międzynarodowy Portal Medyczny

Przemysław Bereza | Damian Kusz
Katedra i Klinika Ortopedii i Traumatologii Narządu Ruchu
Śląski Uniwersytet Medyczny w Katowicach