

Influence of the type of bearing on the survival of the THA implants according to the method of fixation.
Cemented/Cementless



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Osteolysis

Bearing
(ceramic or metal/UHMWPE)



UHMWPE particles



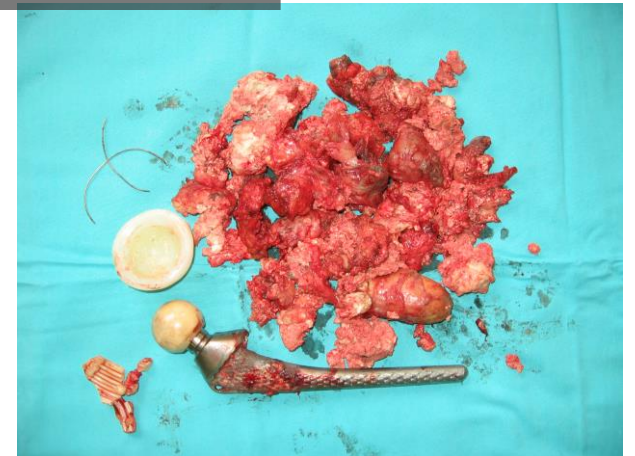
Macrophage activation



Osteolysis and aseptic loosening

Up to 75 % late complications

Ingham and Fishe J. Eng. Med 2000 Biomaterials 2005



Aims of the presentation

Assessment of:

- Influence of bearing type on implant survival

- Influence of bearing type and wear on clinical result

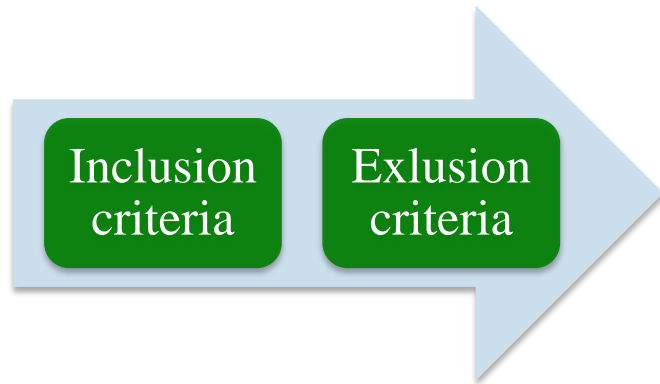
- Influence of bearing wear and loosening

- Influence of bearing type on survival according to fixation method (cemented/cementless)

Material

Between **1998** and **2002** in Żeromski Orthopaedic and trauma Department were implanted

1002 THA



306 THA

Criteria

Inclusion criteria:

Primary THA with 28 mm head

Age between 18 do 65 yo

Correct implantation (cup and stem position)

Exlusion criteria:

THA in rheumatoid arthritis.

Renal failure.

Osteoarthritis after acetabular fractures.

Septic implant loosening.

293 THA

Mean age 53,4 (SD 9,45)

62,8 % F oraz 37,2 % M

Group I
PE – Metal
153 CAB

Group II
PE– Ceramic
67 CAB

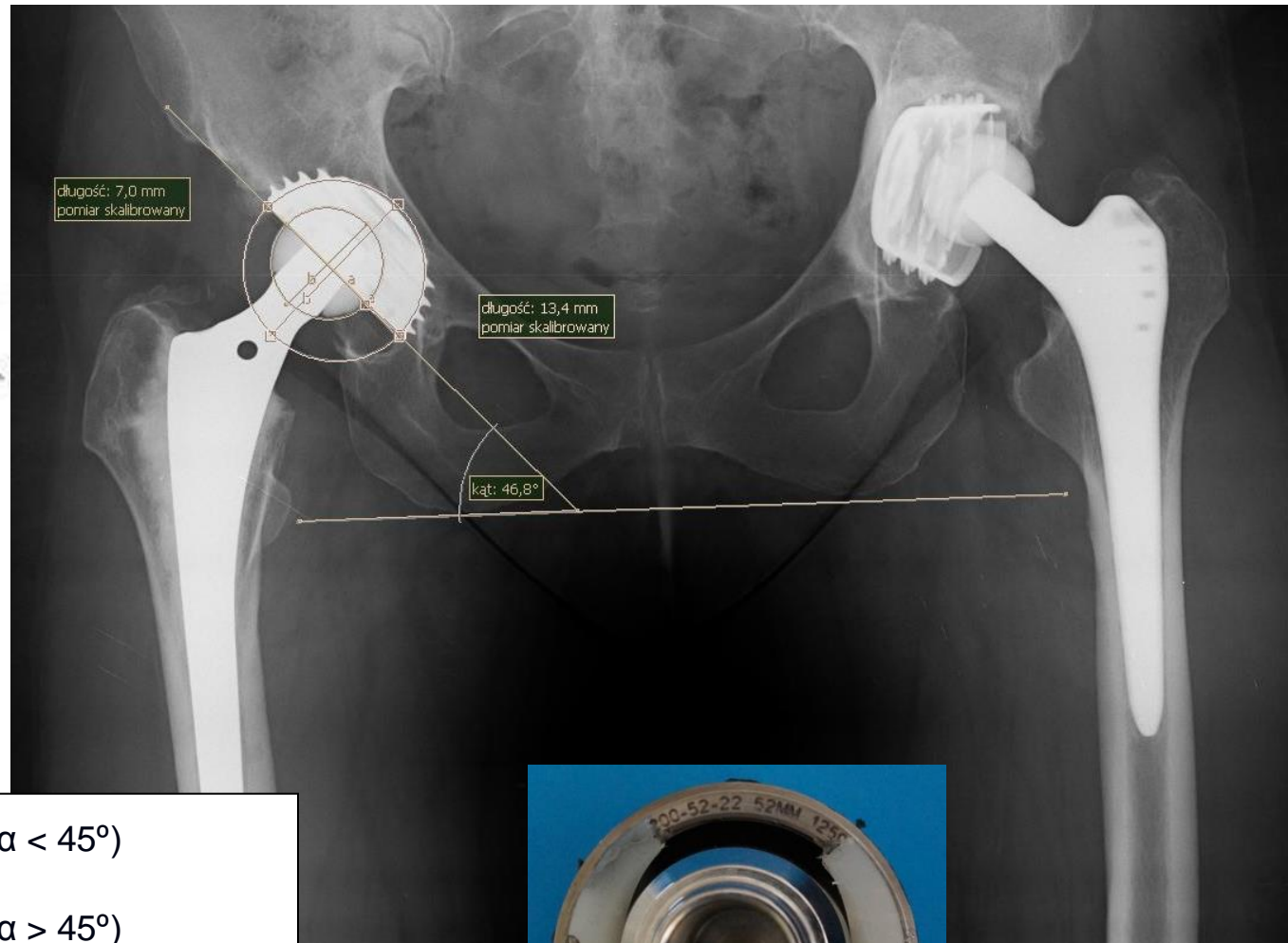
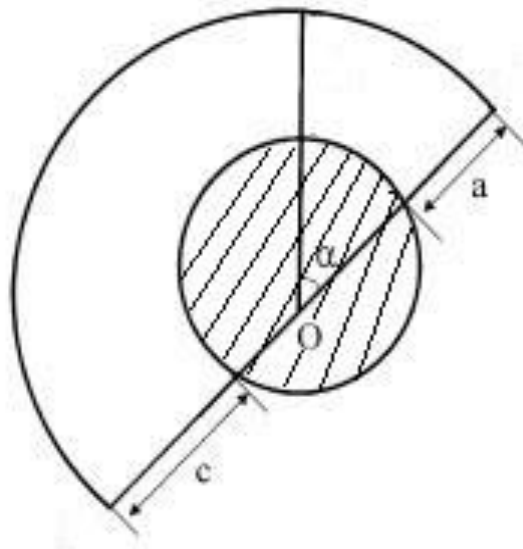
Group III
Metal – Metal
73 CAB

Bearing type	THA No (%)	Mean age (years) (SD)	Cemented implants (%)	Cementless implants (%)
Group I PE-M	153 (52,21)	57,09 (7,73)	112 (73,2)	41 (26,8)
Group II PE-C	67 (22,86)	53,38 (6,34)	2 (3)	65 (97)
Group III M-M	73 (24,93)	45,78 (10,57)	-	73 (100)

Methods

- Assessment of cup position.
- Assessment of stem position.
- Assessment of implant loosening: cup according to **Charnley-Delee** and stem according to **Mallory**.
- Assessment of linear wear - modified **Dorra and Wann** method
- Clinical assessment –**Harris Hip Score (HHS)**
- Statistical analysis - test χ^2 Pearsona, test t-student, test ANOVA
p-value < 0,05

Linear wear according to modified Dorra and Wanna method



Linear wear = $(c-a)/2/0,77$ (kąt $\alpha < 45^\circ$)

Linear wear = $(c-a)/2/0,72$ (kąt $\alpha > 45^\circ$)

angle $\alpha = 90^\circ$ - cup inclination

10-years survival according to bearing type.

Bearing type	N	% 10-years survival (n)	% cup loosening (n)	% stem loosening (n)	mean time to loosening (SD)
Group I PE-M	153	87,58% (134)	12,42% (19)	11,11% (17)	8,52 lat (0,32)
Group II PE-C	67	95,52% (64)	4,48% (3)	2,99% (2)	9,15 lat (2,05)
Group III M-M	73	100% (73)	0% (0)	0% (0)	-
p-value		p=0,00870	p=0,00233	p=0,00272	-

Implant survival depends on type of bearing

Cup wear(decentration) after 10-years years depending on bearing and impact on clinical outcomes (HHS).

Type of bearing	N	Mean wear mm (SD)	Confidence interval - wear	Mean wear at the moment of loosening	Confidence interval – wear at the moment of loosening	Mean HHS (SD)	Confidence interval - HHS
Group I PE-M	153	1,56 (0,03)	1,51 – 1,62	2,28 (0,09)	2,08 – 2,48	84,90 (0,57)	83,76– 86,03
Group II PE-C	67	0,78 (0,03)	0,71 – 0,85	2,00 (-)	-	88,63 (0,64)	87,36– 89,90
p-value - group I and II	-	0,000	-	-	-	0,0015	-
Group III M-M	73	0,02 (0,01)	0,00 – 0,04	-	-	92,84 (0,51)	91,82– 93,86

Influence of bearing wear on loosening in Group I (PE-M) and Group II (PE-C)

	Grupa I PE-M			Grupa II PE-C		
	N	Średnie zużycie w mm	95% przedział ufności	N	średnie zużycie w mm	95% przedział ufności
THA without loosening	134	1,48	1,44 - 1,52	64	0,74	0,70 - 0,78
THA with loosening	19	1,97	1,76 - 2,17	3	2,00	
p-value		0,000058	-	-	-	-

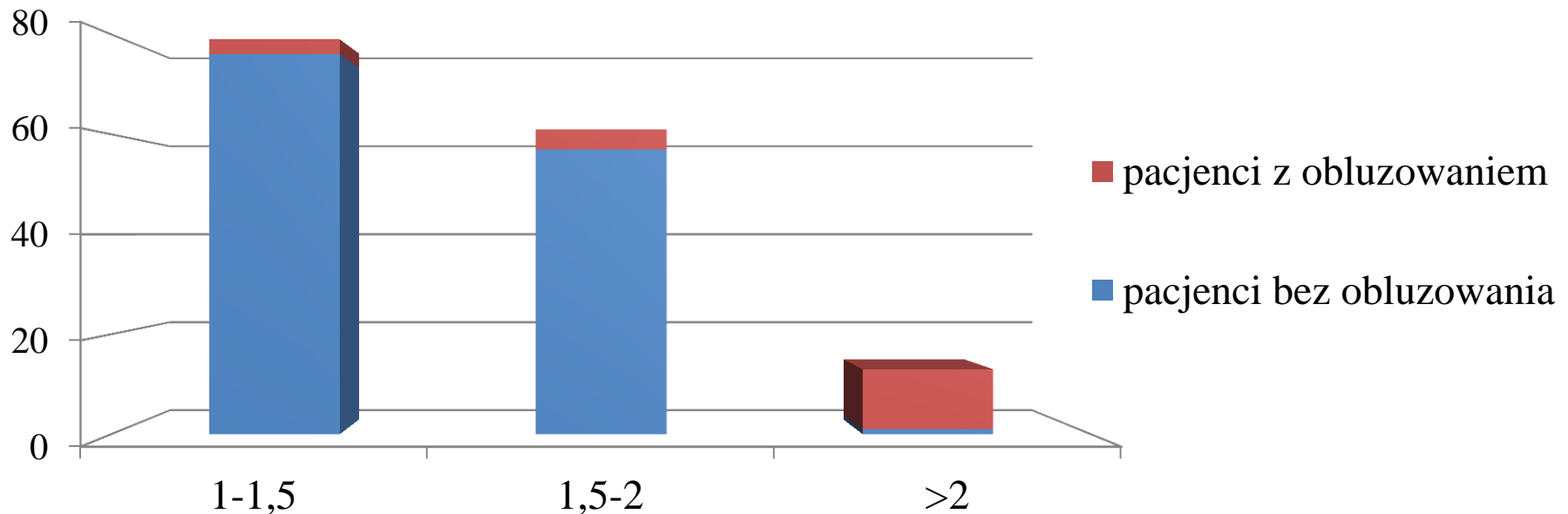
Influence of PE-M bearing wear on cemented and cementless implants loosening

	Cemented implants			Cementless implants		
	N	Mean wear mm	95% Confidence interval	N	Mean wear mm	95% Confidence interval
Implant stable	102	1,43	1,39 - 1,47	32	1,64	1,56 - 1,72
Implant loosening	10	1,85	1,52 - 2,18	9	2,11	1,84 - 2,38
p-value		0,016398			0,003222	



Group I (PE-M) greater linear wear in cementless cups (0,18 mm/rok) comparing to cemented (0,15 mm/rok).

Influence of bearing wear on loosening in group I (PE-M)

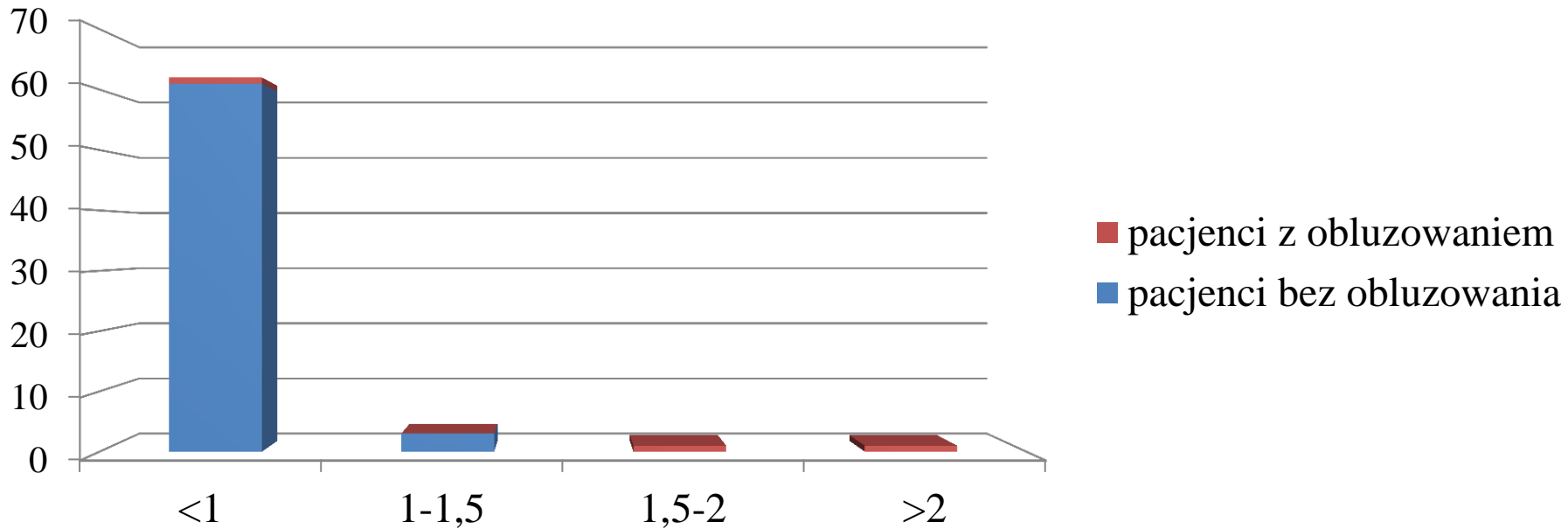


□ wear 1-1,5 mm - 7,59% THA implants loosening,

□ 1,5-2 mm -13,11%,

□ > 2 mm - 92,31%

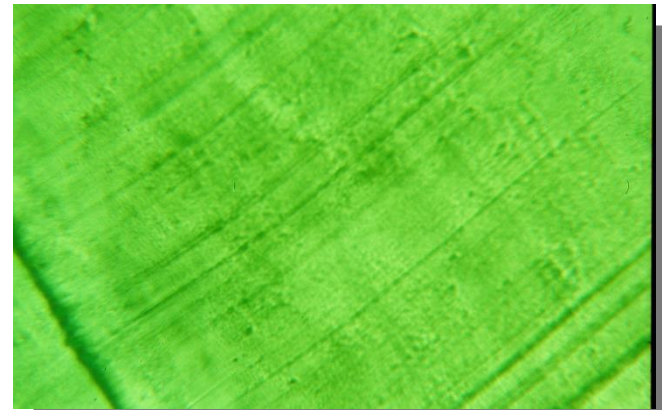
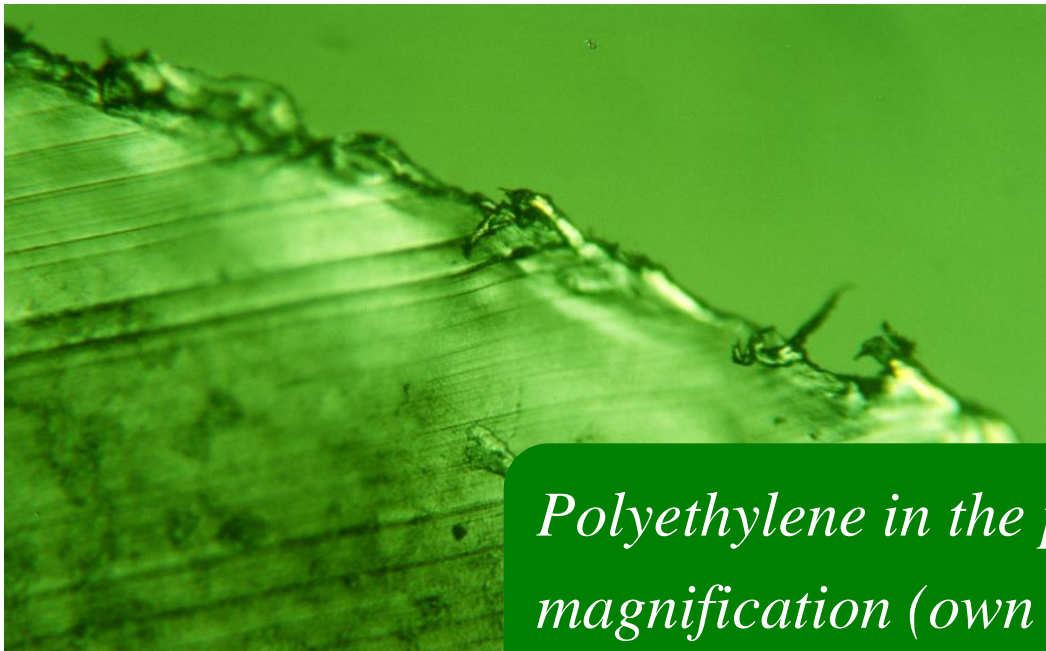
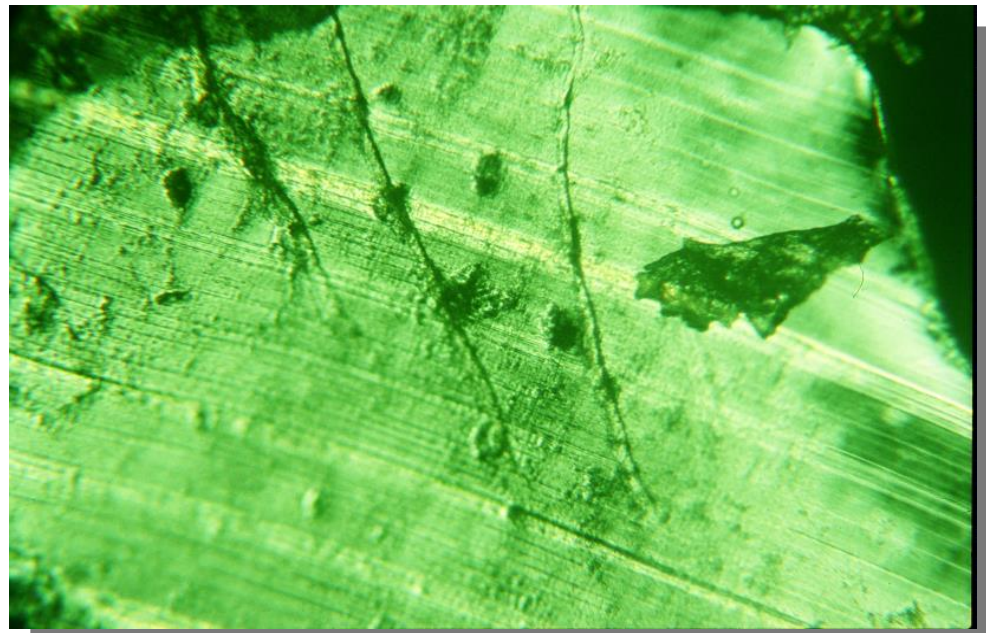
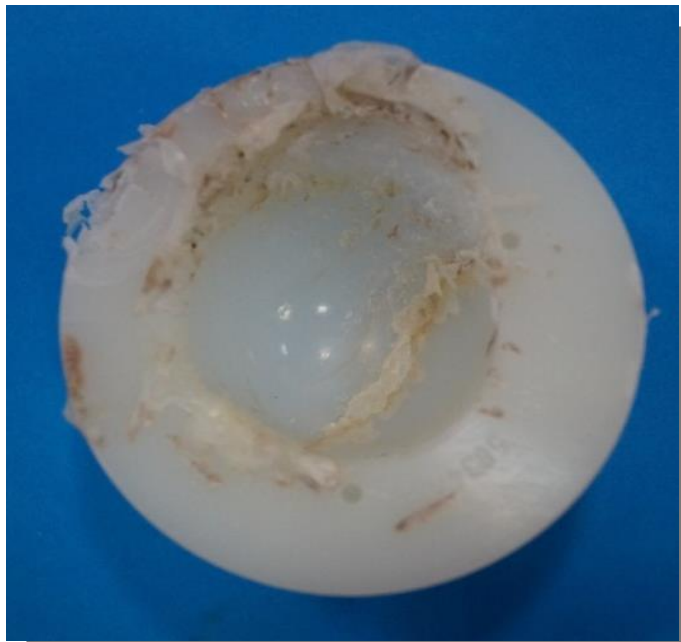
Influence of bearing wear on loosening in group I (PE-C)



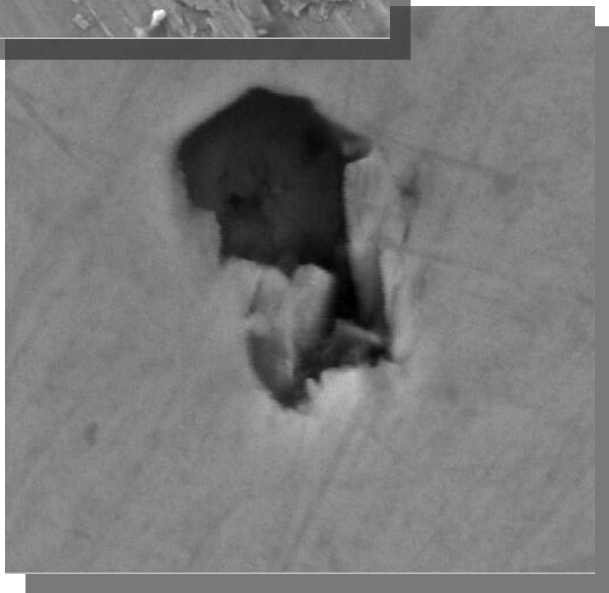
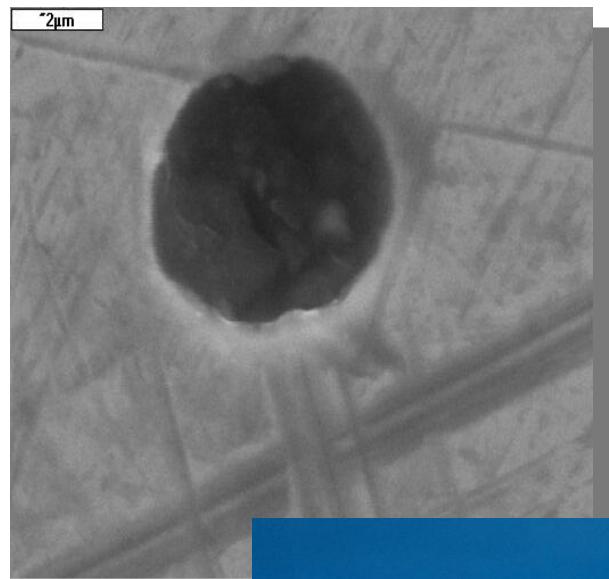
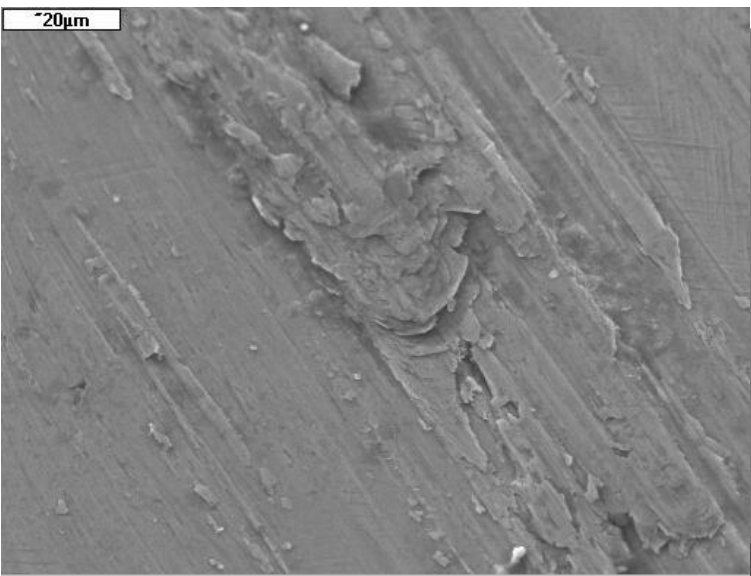
□ wear 1 mm - 1,6% THA implants loosening,

□ 1-1,5 mm - 13,11%,

□ > 1,5 mm - 100%



Polyethylene in the polarizing microscope, 350x magnification (own material)



*magnification
5000x.*

**Image CoCr metal head in scanning electron
microscopy from loosened implant**

10-years survival according to implant fixation. (cemented, cementless)

	N	% 10-years survival (n)	% loosened cups (n)	% loosened stems (n)
Cemented	114	93,85% (107)	8,77% (10)	7,89% (9)
Cementless	179	93,29% (167)	6,70% (12)	5,58% (10)
p-value		p=0,8540	p=0,5074	p=0,4297

Analysis of the material showed no difference in 10-year survival between the cemented and cementless implants if type of bearing wasn't considered.

10-years survival according to implant fixation (cemented, cementless) PE-M bearing

Type of implant	N	% 10-years survival (n)	% loosened cups (n)	% loosened stems (n)
Cemented	112	93,75% (105)	8,93% (10)	8,04% (9)
Cementless	41	78,05% (32)	21,95% (9)	19,51% (8)
p-value		0,004728	0,030599	0,045785

10-years survival rate of PE-M bearings is higher for cemented implants compared to uncemented.

10-years survival of cementless implants according to bearing type

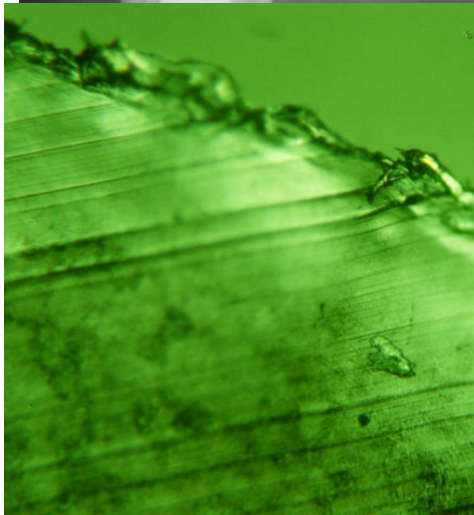
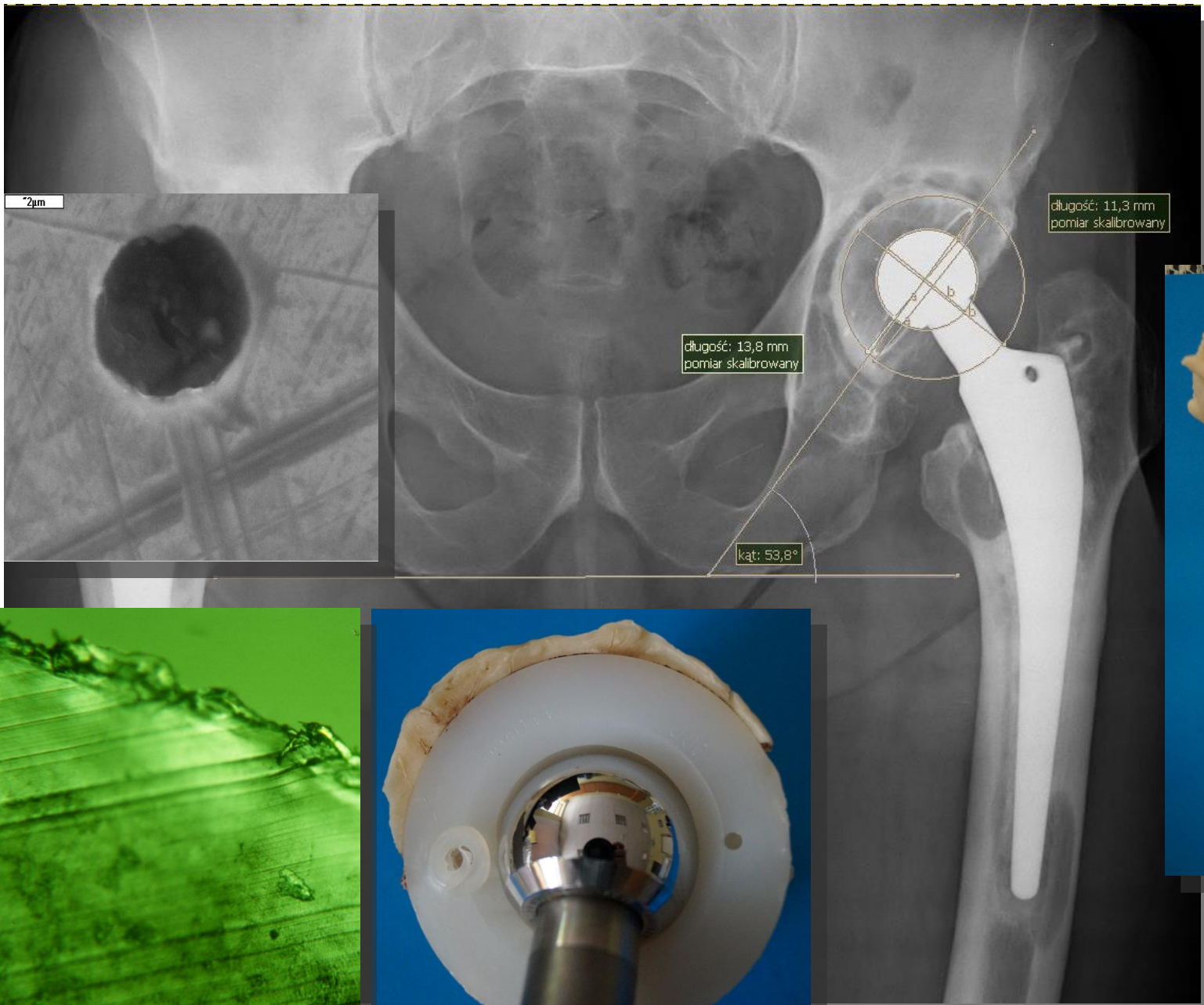
	Bearing PE-M (n/N)	%	Bearing PE-C (n/N)	%	p-value for comparison of PE-M and PE-C	Bearing M-M (n/N)	%
10-years survival	32/41	78,05%	61/64	95,31%	0,0067	0/73	100%
Cup loosening	9/41	21,95%	3/64	4,69%	0,0067	0/73	0,00%
Stem loosening	8/41	19,51%	2/64	3,13%	0,0053	0/73	0,00%

The lowest 10-years survival rate (cementless implants) was found for PE-M bearing.

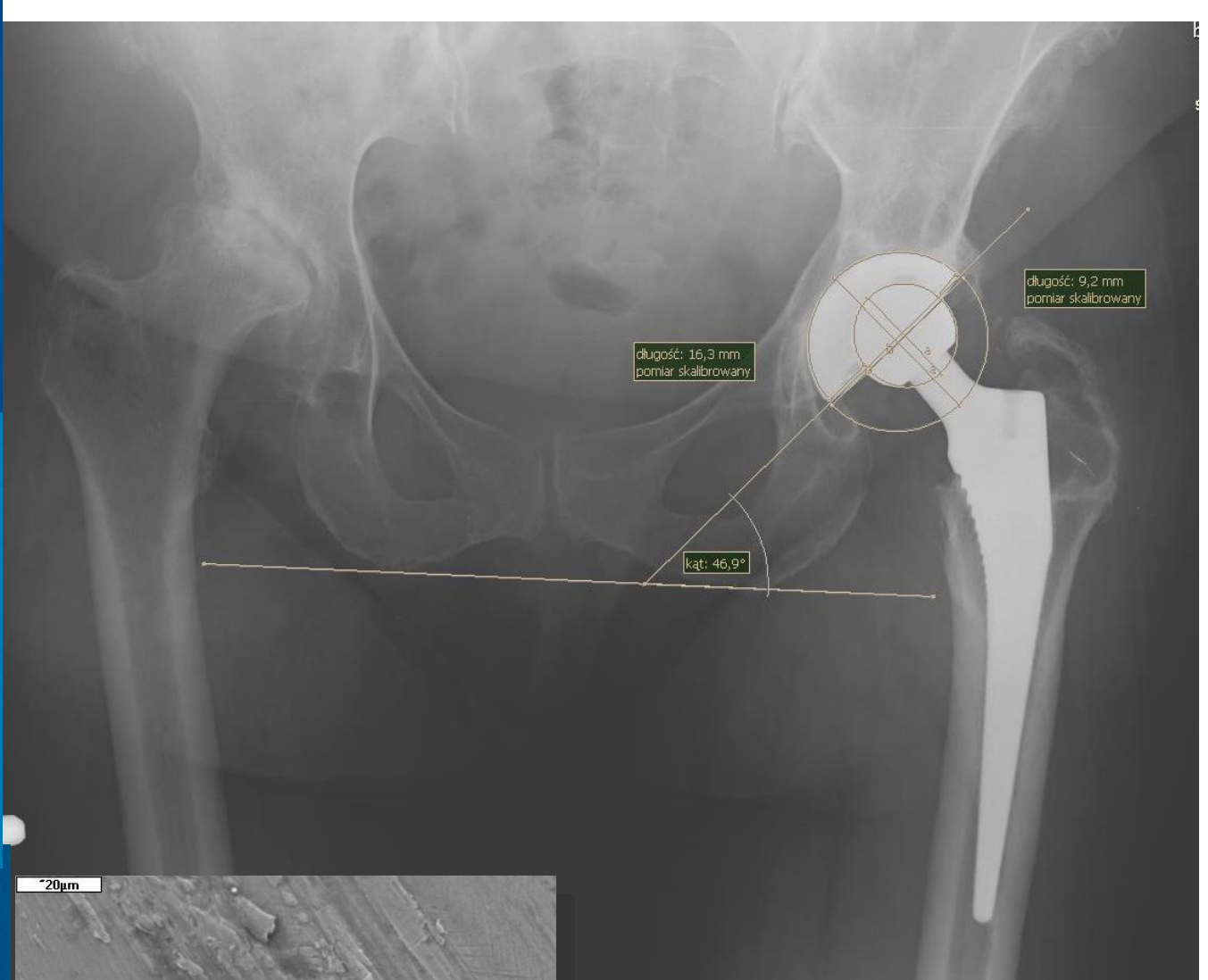
Influence of age at the time of THA on bearing wear

	The correlation index between age at time of surgery and decentration	p-value
Group I PE-M	-0,3241	p=0,000
Group II PE-C	-0,1441	p=0,248
Group III M-M	-0,142	p=0,231

The influence of the younger age of patients on bearing wear was found only in group I (PE-M).



CT I. 63 Linear wear = $(c-a)/2/0,72$ (kąt $\alpha > 45^\circ$) = 1,73



Sz L I. 66 Linear wear =
 $(c-a)/2/0,72$ (kąt $\alpha > 45^\circ$) = 4,9

Conclusions

1. The longest survival rate was in group M-M bearing and the shortest in the PE-M.

2. Loosening depends on the size of bearing wear. Most often occurs in PE-M bearings.

3. zużycie polietyleny w porównaniu z głową ceramiczną.
In M-PE bearing head is responsible for the increased wear in comparison with the ceramic head

Conclusions

4. The survival rate of cemented and cementless implants is comparable if not taken into account the type of bearing

5. PE-M bearing reduces significantly the survival of uncemented implants.

6. The younger age of patients and the associated increased physical activity increases the wear of PE-M bearings.

7. The M-M bearing demonstrated the best clinical outcome and survival.

Thank you for attention