Prof. Arnold Caplan:

- Cell-based therapy is in its infancy and those of us who have helped to nurture it have accepted to modify our scientific truths as more information becomes available. The naysayers of cell-based therapy have done the medical profession and the patients a great service by stimulating us to continue to refine these potent therapeutics. This has allowed the dogma of the day to be modified to allow more efficacious use of cell-based therapies.

***Tissue Engineering* 2019**

Autologus Peripherial Hematopoietic Stem Cells Cd34+ in Hip Osteoarthritis: Evidence and Personal Data

R&D project co-financed
by EU NO.RPLD.01.02.0210.0125/19

Orthopedics

Marek Krochmalski, MD

Jakub Krochmalski, MD

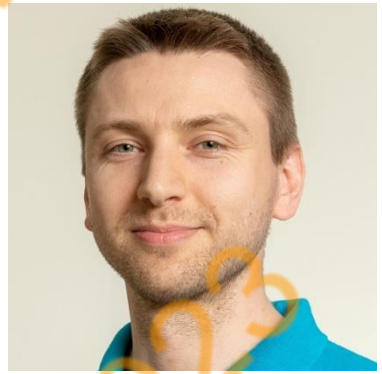
Radiology

Sylwia Gieletucha-Rosiak, MD

Physiotherapy

Marek Kiljański, PhD

Kamil Klupiński PhD



Piotr Szafraniec, MSc

ISIAT 7th International Symposium on Intra-Articular Treatment - Athens 5–7 October 2023

Our research facility

MEDICAL MAGNUS CLINIC
Orthopedic & Sports Medicine Hospital
with regenerative medicine ward
& **Rehabilitation Center**
City of Lodz | Poland

Affiliations

1. **Medical Magnus Clinic**, Lodz, Poland
2. **Department of Biomedicine and Genetics**
   Department of Medical Biology and Microbiology, Medical University of Lodz, Poland
3. **Department of Arthroscopy**, **Minimally Invasive Surgery and Sports Traumatology**
   Medical University od Lodz, Teaching Hospital of the Military Medical Academy – Central Veterans Hospital, Lodz, Poland
4. **Departament of Radiology**
   Polish Mother's Memorial Hospital & Research Institute, Lodz,Poland
5. **Department of Radiology**
   Medical University of Lodz, Poland Institute of Pediatrics

Research team members

• Orthopedists	*Jarosław Fabiś [3], Marek Krochmalski [1], Jakub Krochmalski [1]*
• Physiotherapists	*Marek Kiljański [1], Piotr Szafraniec [1], Kamil Klupiński [1], Eleonora Stefańska-Szachoń [1]*
• Internists	*Robert Błaszczak [1]*
• Radiologists	*Piotr Grzelak [4], Sylwia Gieletucha-Rosiak [5]*
• Anesthesiologists	*Danuta Krochmalska [1]*
• Biomedical and genetic scientists	*Ewa Brzeziańska-Lasota [2], Kamila Baran [2], Jolanta Kryczka [2]*
• Statisticians	*Ryszard Bielewicz [1], Mariusz Mianowany [1]*
• Administrative coordinator	*Karolina Kamecka [1]*
• Administrative personnel	*Aleksandra Partyczyńska [1], Monika Borowska [1], Agnieszka Połomska [1]*
• Media	*Grzegorz Michałowski [1]*

About the project

„HSCs CD34+ in the treatment of OA and joint cartilage injuries – R&D project”

co-financed by EU No.RPLD.01.02.0210.0125/19

RESEARCH GROUP:	240 joints, level of osteoarthritis 1°- 4°
DURATION:	Dec 2020 – Dec 2023 with 2 years follow up after HSCs administration
Own contribution:	2 221 800,00 PLN (ca. 500 000 EURO)
EU funding:	2 221 800,00 PLN (ca. 500 000 EURO)

The main goals of the project

- **Slowing down** the progression of osteoarthritis (OA) and **postponing** the need of THA, TKA and TAA (longer self-use of a patient's own joints),

  even avoid THA, TKA and TAA (at a level of 1°-2° by Kellgren-Lawrence scale)
- **Protecting from undergoing even 3-4 arthroplasty** procedures in a patient's lifetime
- **Reducing costs of health care** (i.e. less arthroplasty procedures in a lifetime, multiple pre- & post-operative rehabilitation cycles, disability-related costs)

Materials & Methods

Our **research and development project** is based

on the **Cochrane Library's**

"Stem cell injections for osteoarthritis of the knee (Protocol)"

Fundusze Europejskie Program Regionalny
Rzeczpospolita Polska
promuje łódzkie
Unia Europejska Europejski Fundusz Rozwoju Regionalnego

Statistical procedures

- Normality of numerical traits was tested by using the **Shapiro-Wilk W test**
- A multifactor analysis of variance (**ANOVA**) with repeated measures was performed to appraise the dynamics of the studied characteristics, and between group differences, throughout the observation period, *i.e.*, at **baseline** (before the HSCs administration) and **6 weeks, 3 months, 6 months, and 12 months** after the HSCs administration
- **Generalized linear models** (GLM) with repeated measures were carried out for abnormally distributed variables
- **A p-value < 0,05** was deemed statistically significant

Stages of the project

- **Qualification** based on clinical and MRI and X-ray examinations
- **Collection** of HSCs CD34+ through apheresis
- **Phenotypic** and quantitative assessment of the stem cells collected
- **Intraarticular injections** of HSCs CD34+ within the operating theater under spine anesthesia
- **Rehabilitation** during hospital stay
- **Rehabilitation** on an outpatient basis
- **Periodic** medical and physiotherapeutic **check-ups** after 6 weeks, 3 months, 6 months, 1 year and 2 years; MRI after 6 months, 1 year and 2 years; X-ray after 2 years
- **Evaluation** of the results
- **Introduction of a novel medical procedure into the medical market**
- **Scientific publishing process**

Methodology

- Basically, the project did not encompass the selection of a control group
- All study participants have been rehabilitated for not less than 6 weeks
- Division of patients into research groups:
  - Clinical – radiological, according to the *Kellgren-Lawrence* Scale
  - The standardized rehabilitation program assumed the patient full participation for 6 months
  - However, some patients did not realize that their participation in the program was part of the plan to improve their clinical condition and meet the main goal of the Project.
  - The division has been made spontaneously, after the analysis of 1-year study results.
    - group of **NON-REHABILITATED** subjects includes patients who have undergone the 6-week rehabilitation program
    - group of **REHABILITATED** participants includes patients who have entered the entire 6-month rehabilitation program

Characteristics of the study cohort at baseline

- This study presents the results obtained as **one or two years follow up including 70 hip joints**

- The present study comprised **36 clinic patients** who had undergone the procedure of intraarticular stem cell administration, **11 women** and **25 men**.

- The study participants' **mean age amounted to 55,1 years** (median 58,0 years; SD 12,2 years: range from 25 to 76 years). The distribution of the variable met the assumptions of normality.

- Their **body mass averaged to 87,6 kg** (median 85,0 kg; SD 15,2 kg: range from 50 to 120 kg). The distribution of the variable met the assumptions of normality.

- Their **body height averaged to 1,75 m** (median 1,76 m; SD 0,06 m: range from 1,60 to 1,85 m). The distribution of the variable met the assumptions of normality.

My first presentation about stem cells in Poland

titled

STEM CELLS APPLICATION
IN THE TREATMENT OF
THE PATELLAR TENDON ENTHESOPATHY
Case report

at

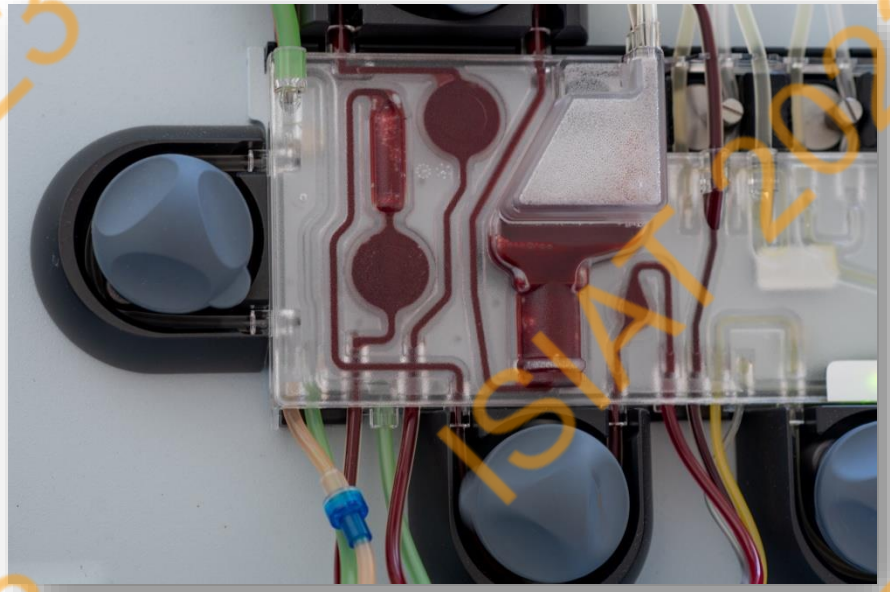
I International Congress of Sport Traumatology and Arthroscopy for Central and Eastern Europe

dated

12-13 June 2009, Warsaw

Blood apheresis 03.03.2009

Our first patient Pudzianowski Mariusz
Strongman 5 Times World Champion



Blood Stem Cells collection

Our beginning

COBE SPECTRA

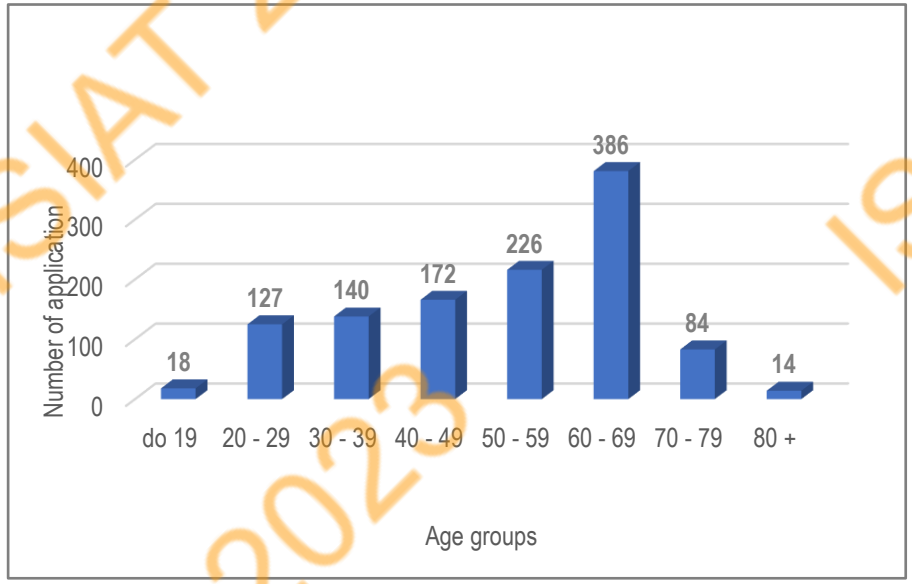
SPECTRA OPTIA

Our experience - some statistics

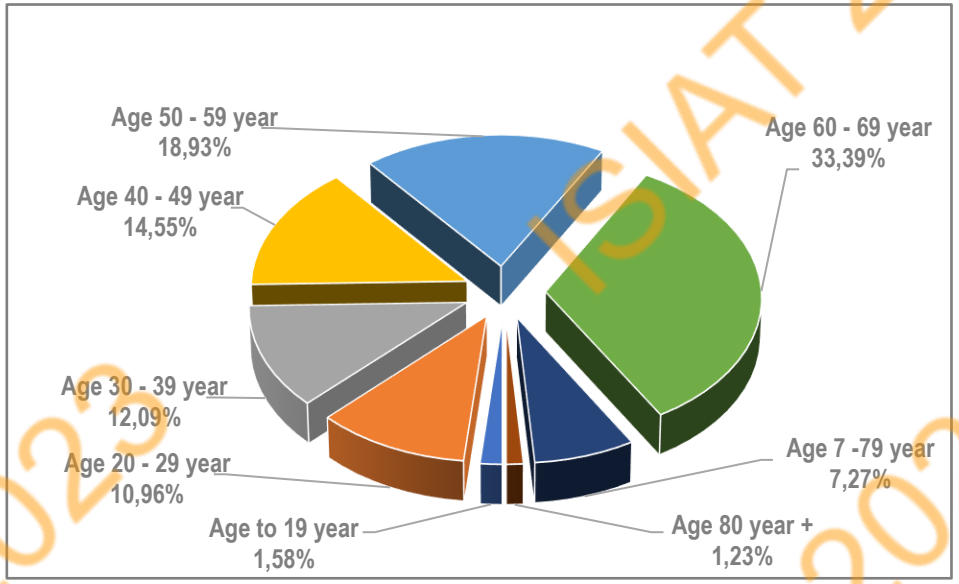
We have started on … 03.03.2009

Till today:

- **1 122 patients**
- **2 258 stem cells administrations**

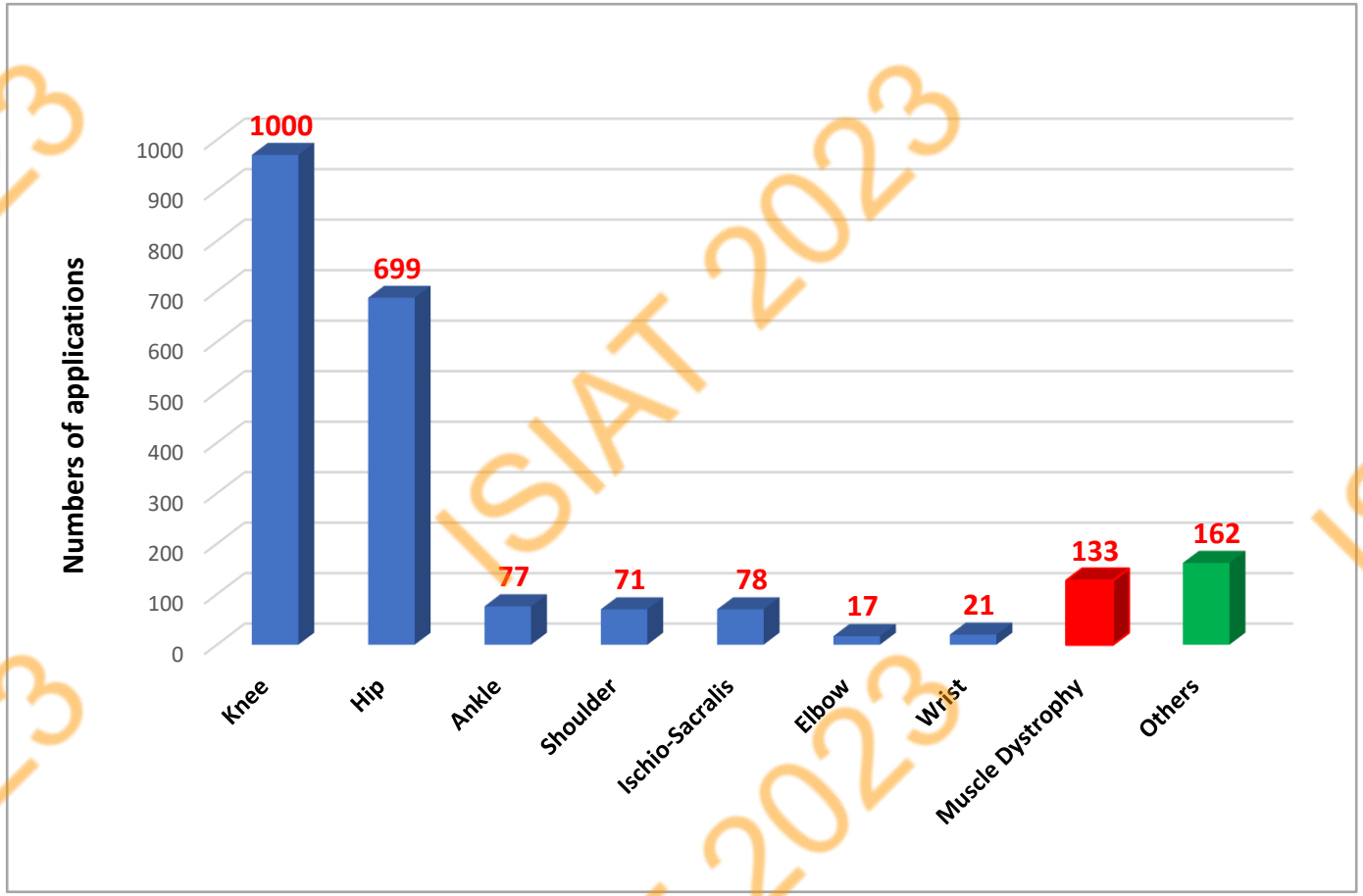


Application in different age groups



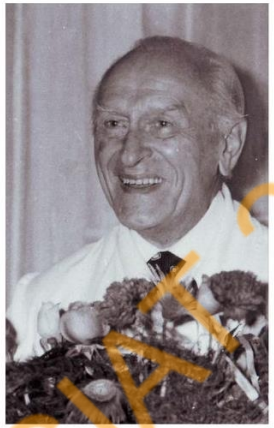
Percentage share of application in individual age groups

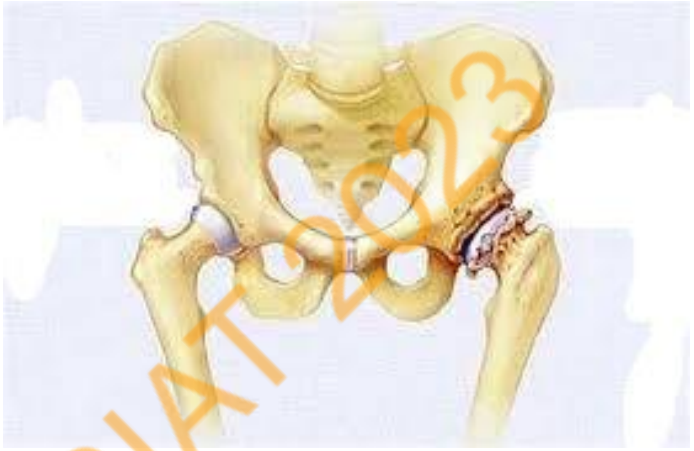
HSCs CD34+ application area
03.03.2009 - 01.04.2023

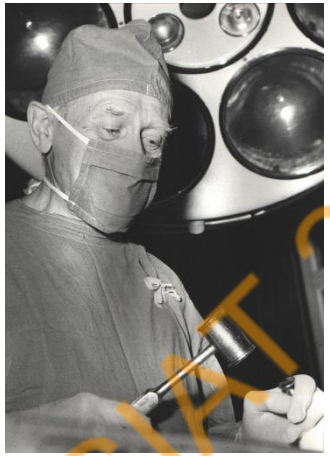


„Sick hip joint = SICK MAN”

prof. Wiktor Dega
(1896 – 1995)

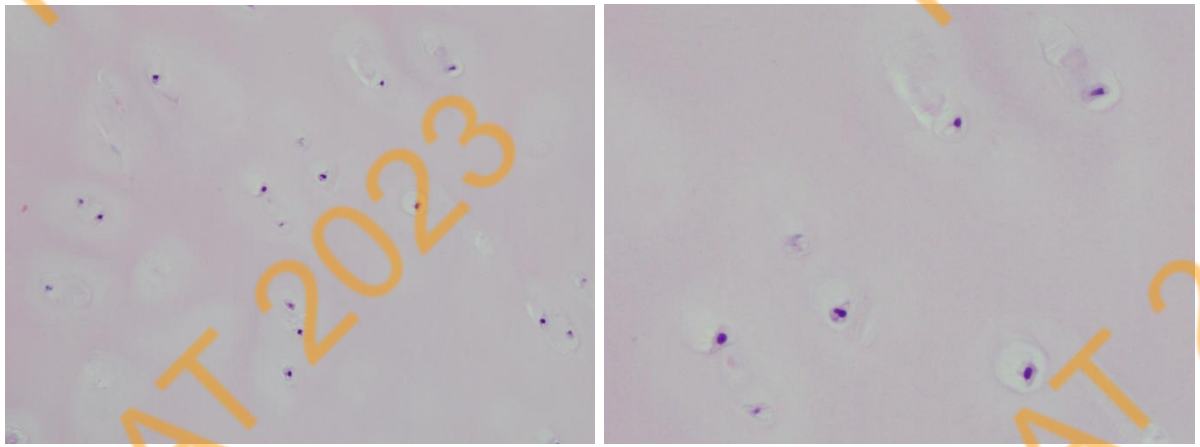




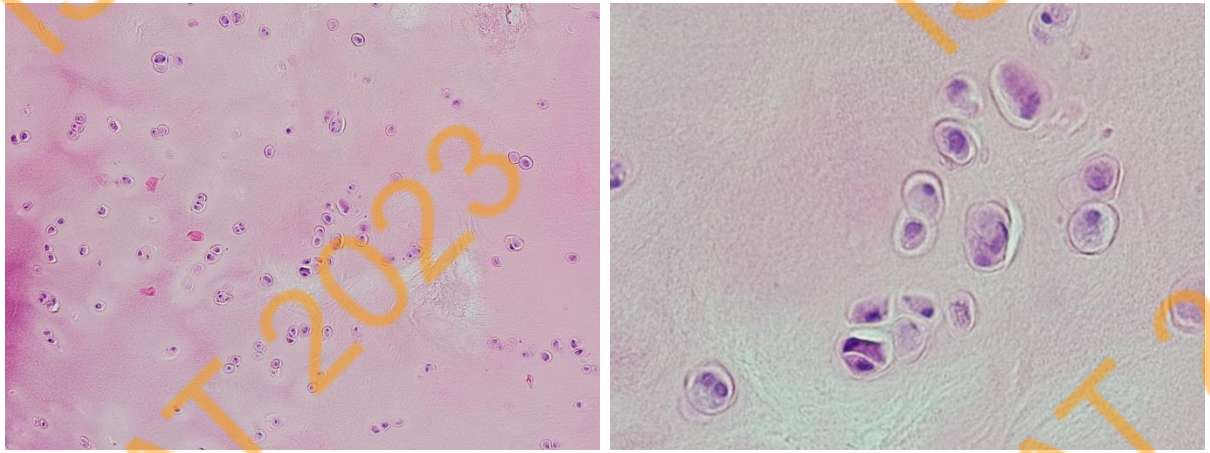


Histopathology 1 year after HSCs CD34+ injection

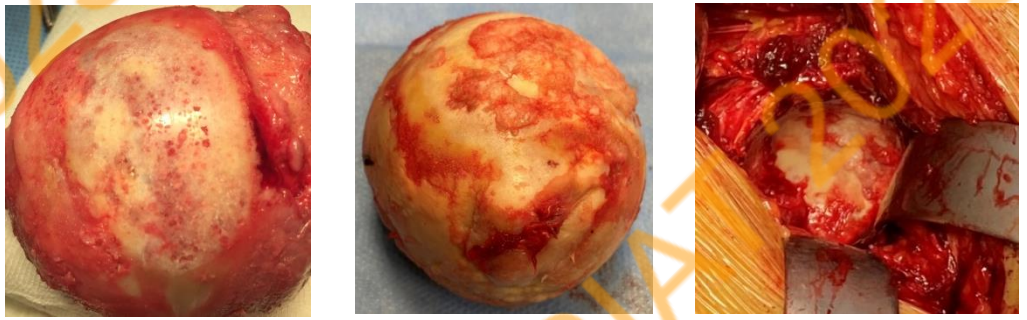
Chondrocytes in hip OA are no active

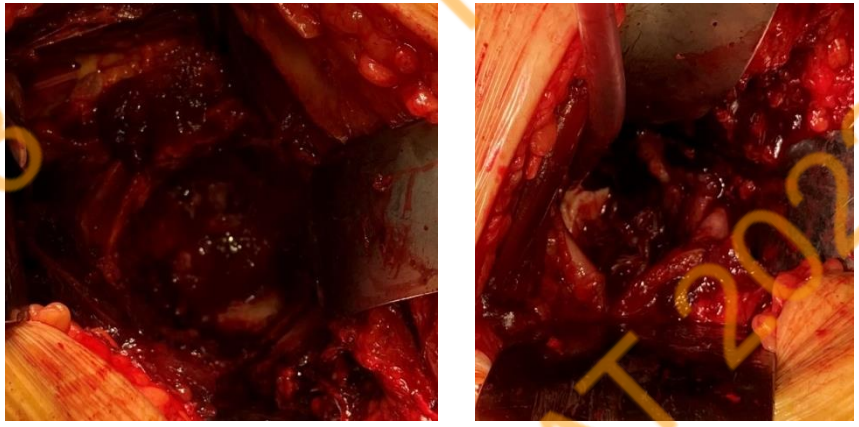


Chondrocytes in hip OA after injection HSCs are active (why?)



View of resected femur head





Step by step procedure


ISIAT 2023
medical magnus clinic

Adduction movement improvement

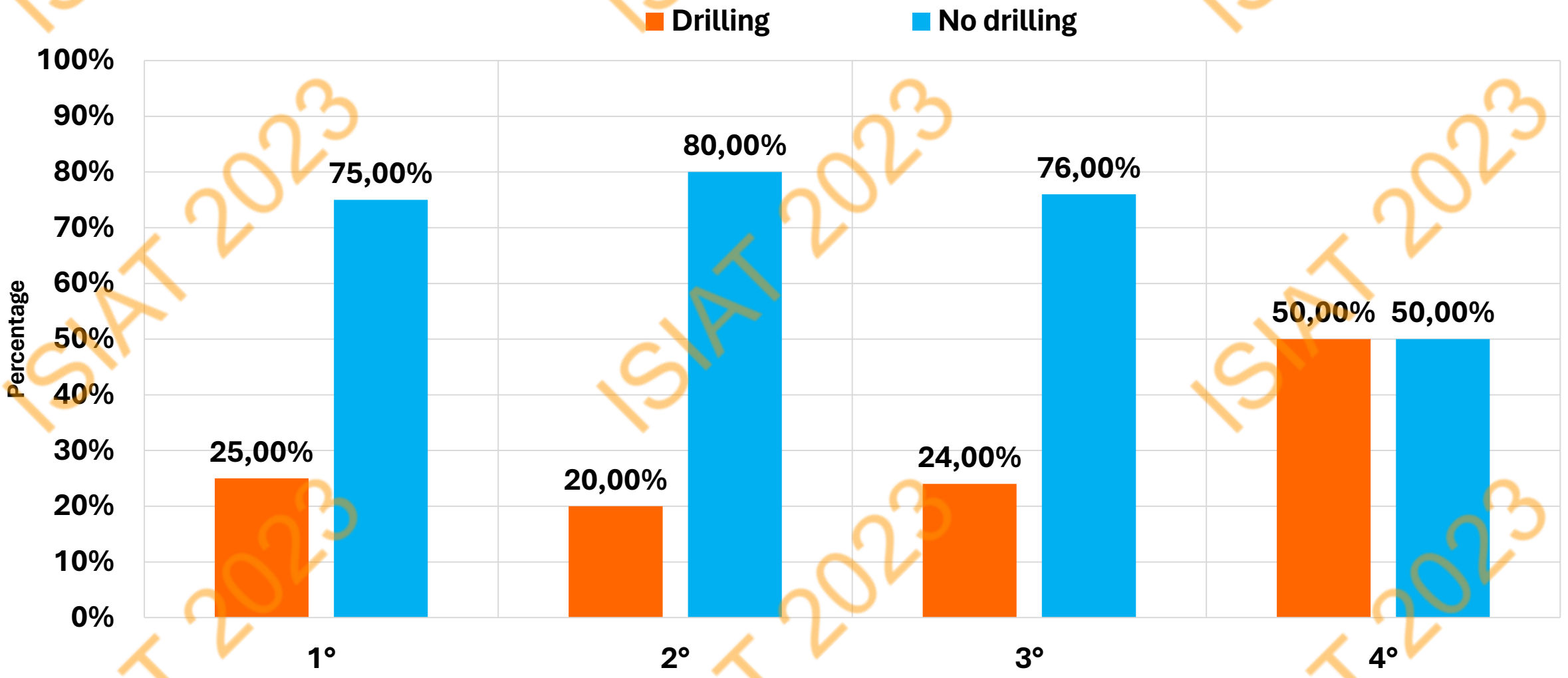
30°

40°

Needling and Drilling and HSCs injection under US-guided

Thick 1.2 gauge needle guided
K-wire 1.0 mm
Physiotherapeutist rotates hip joint
US-guided drilling

Drillig of the femoral head by degree of degeneration of the hip joint (p = 0,1550)



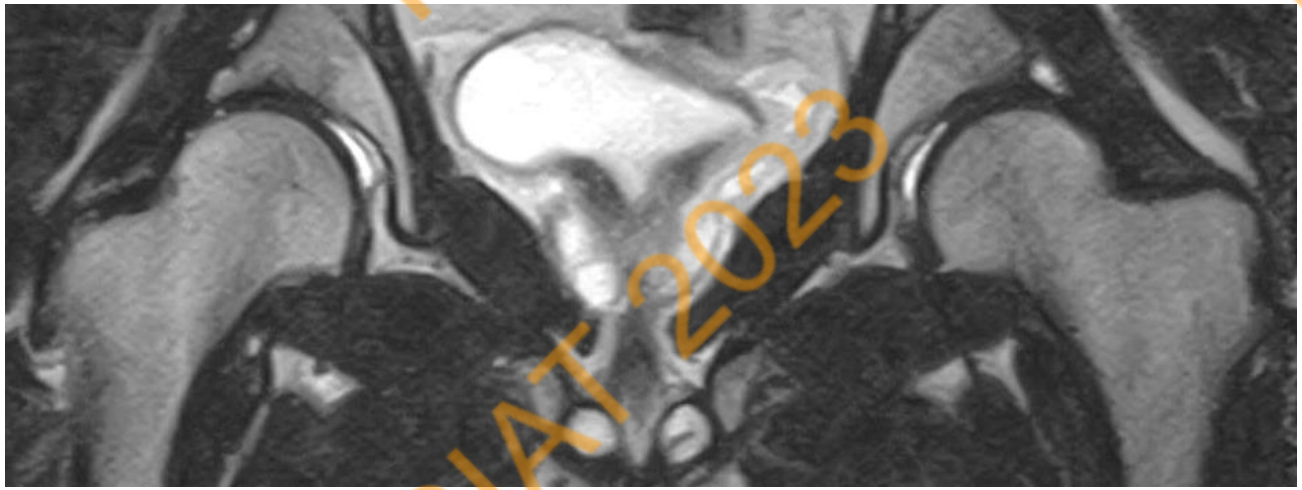
X Ray Examination Kellgren-Lawrence Grade

2021
W.M.57 y.o.
R I/II
L I/II

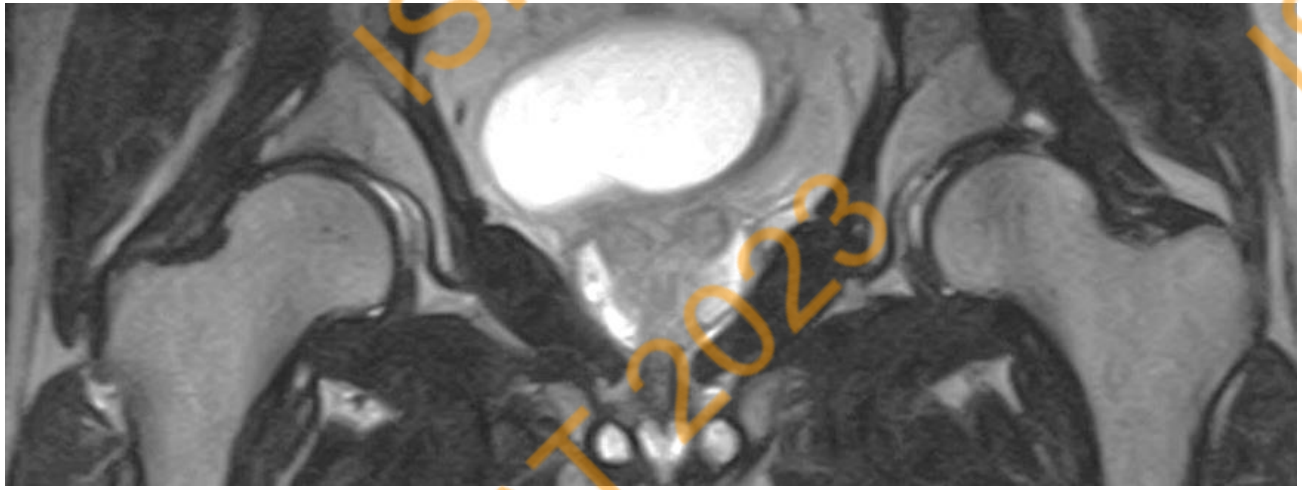
2023
R II
L II

MRI Examination T2 Coronale
Modified Outerbridge Grading of OA

2021
W.M. 57 y.o.
R I/II
L I/II

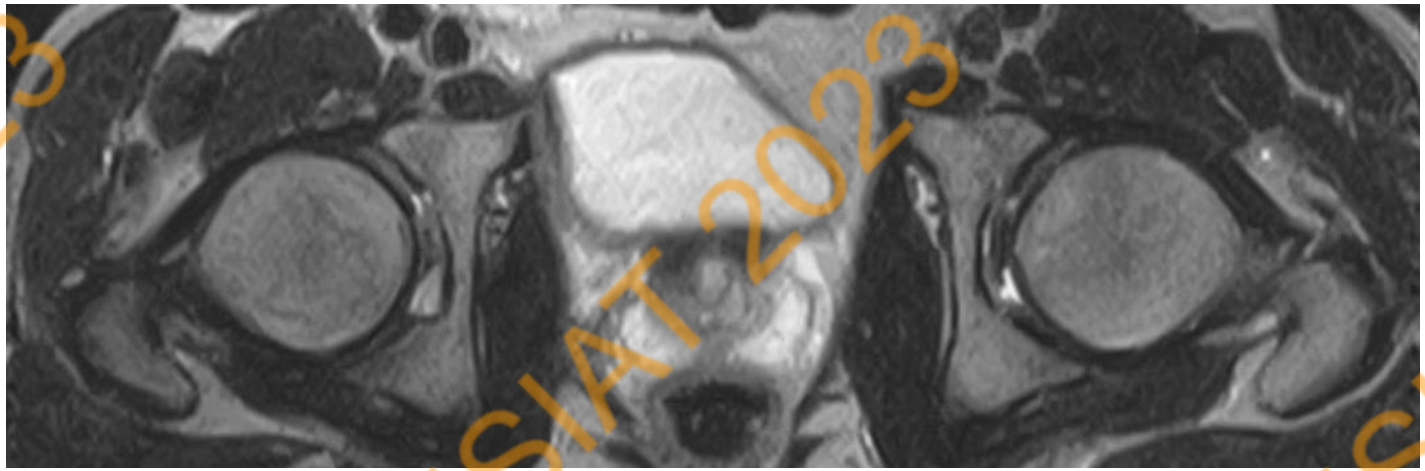


2023
R II
L II

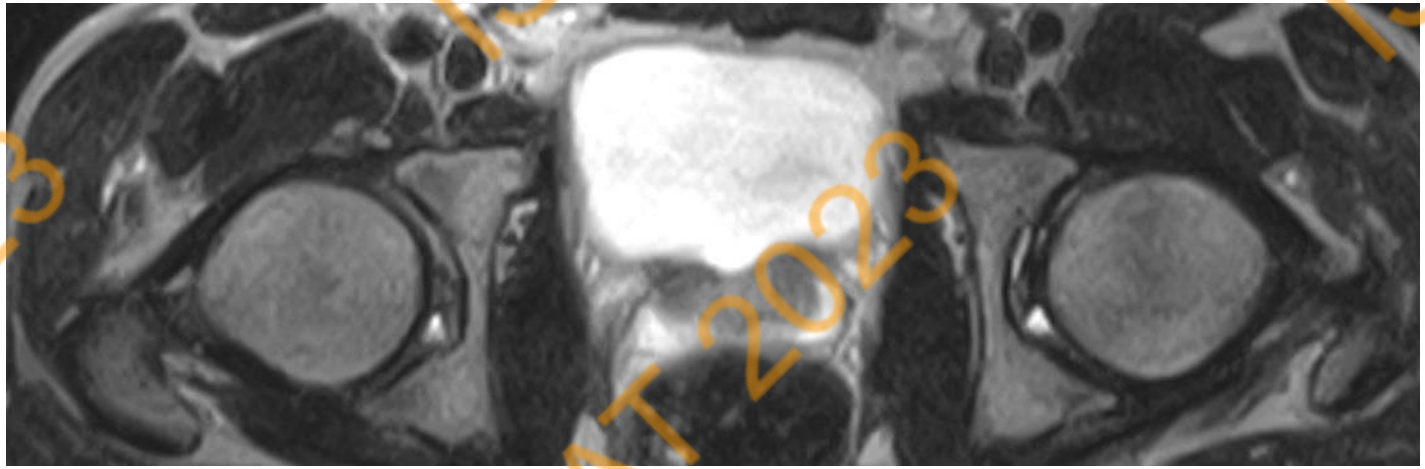


MRI Examination T2 Axiale Modified Outerbridge Grading of OA

2021
W.M. 57 y.o.
R I/II
L I/II



2023
R II
L II



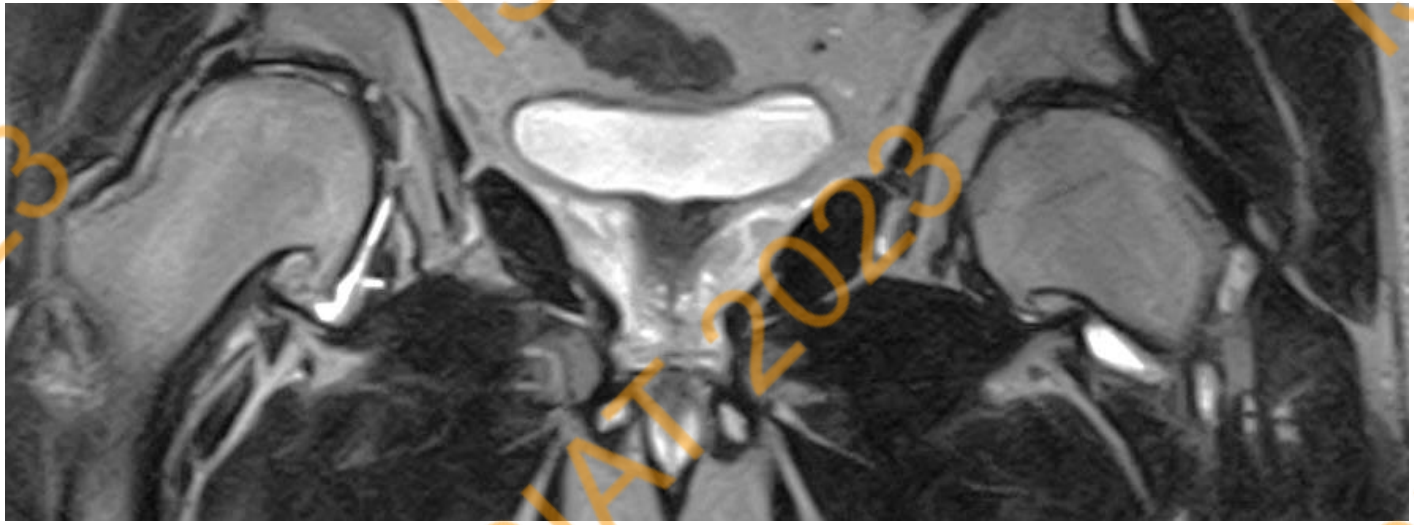
X Ray Examination Kellgren-Lawrence Grade

2020
C.S. 47 y.o.
R IV
L II

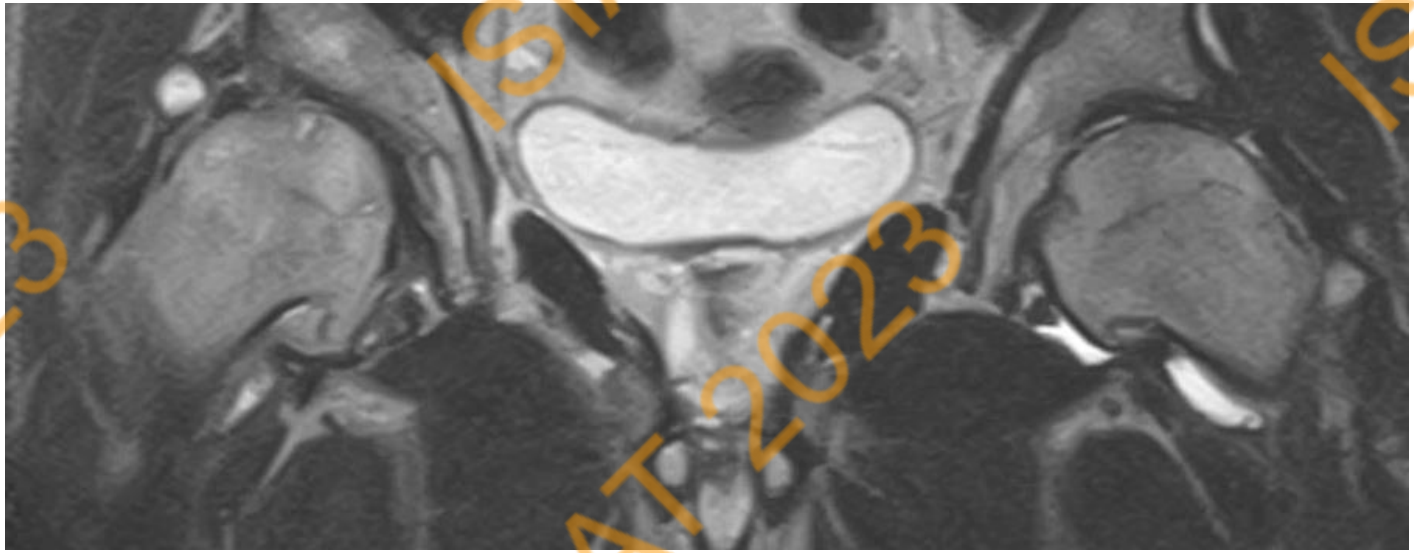
2022
R IV
L 2

MRI Examination T2 Coronale modified Outerbridge grading of OA

2021
C.S. 47 y.o.
R II/III
L II/III

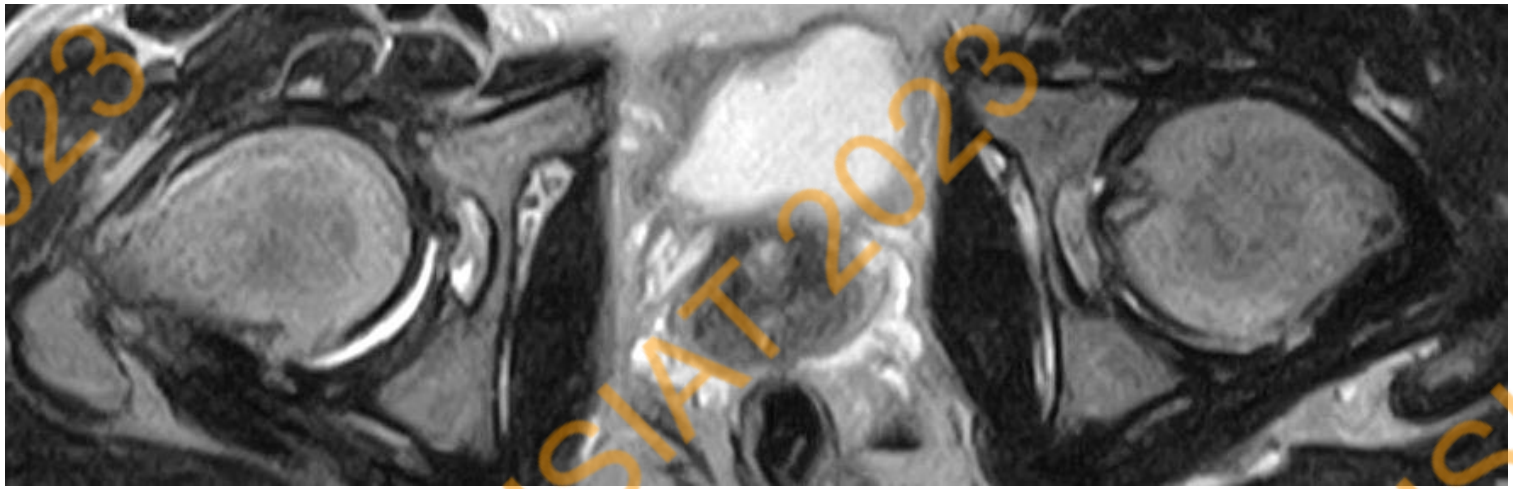


2023
R III
L III

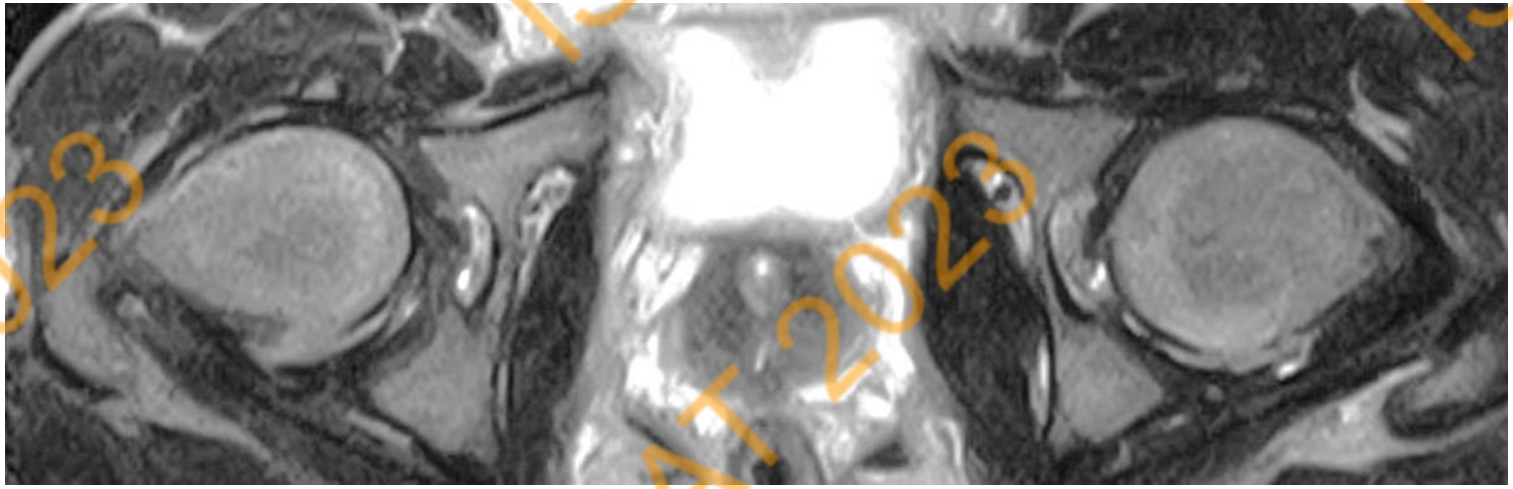


MRI Examination T2 Axiale modified Outerbridge grading of OA

2021
C.S. 47 y.o.
R II/III
L II/III



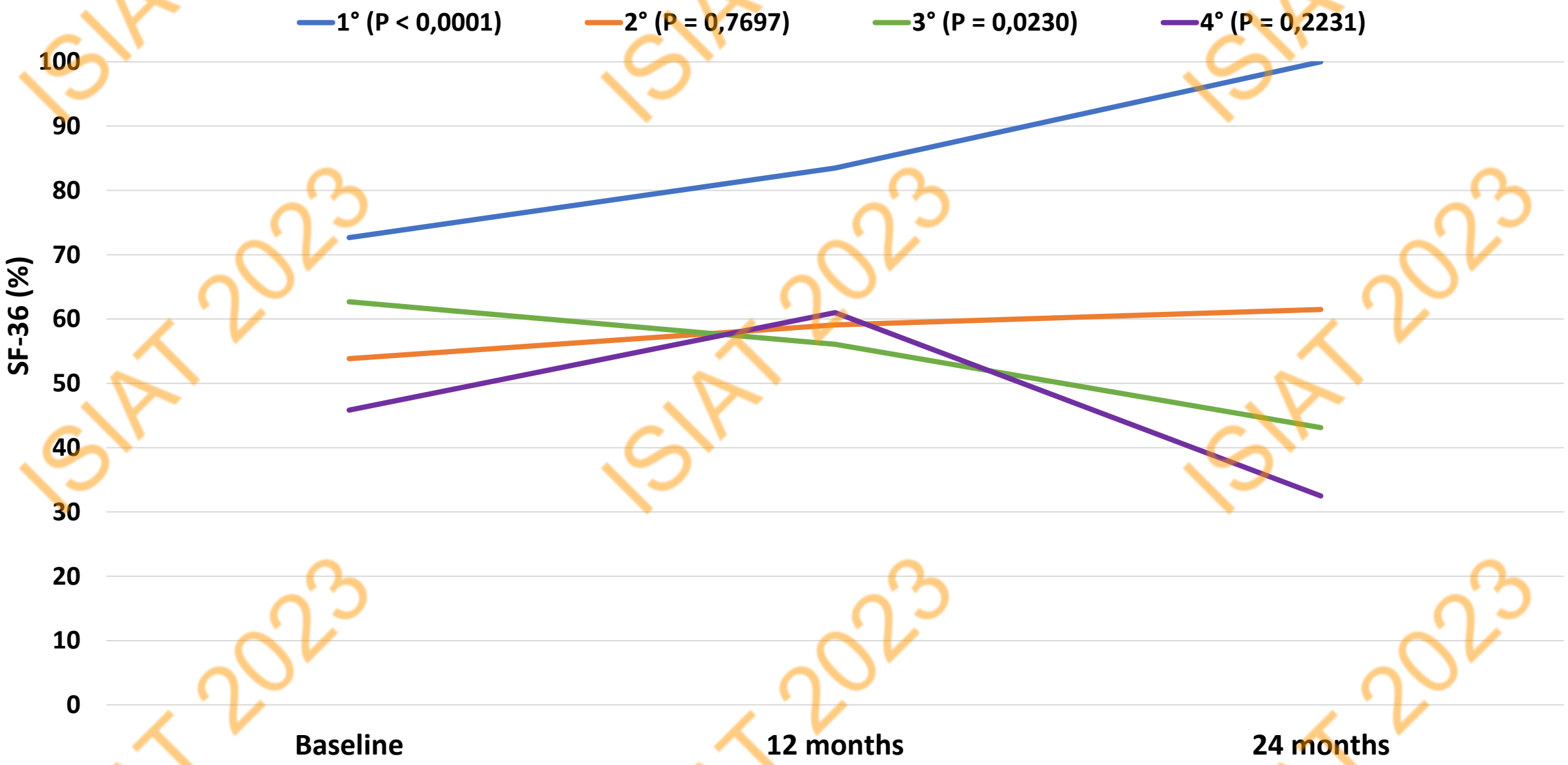
2023
R III
L III



SF-36 Physical Functioning (%)

Time Point	Degree of degeneration	Statistical parameter			
		M	*SD*	*Me*	*p-value*
Baseline (t_0)	1°	72,67	22,96	66,00	
	2°	53,85	22,28	62,50	
	3°	62,69	25,97	60,00	
	4°	45,83	28,88	35,00	
12 months (t_{12})	1°	83,50	30,10	100,00	
	2°	59,09	21,72	60,00	
	3°	56,09	30,67	60,00	
	4°	61,00	22,19	50,00	
24 months (t_{24})	1°	100,00	0,00	100,00	< 0,0001
	2°	61,50	29,44	75,00	= 0,7697
	3°	43,13	26,85	35,00	= 0,0230
	4°	32,50	10,61	32,50	= 0,2231

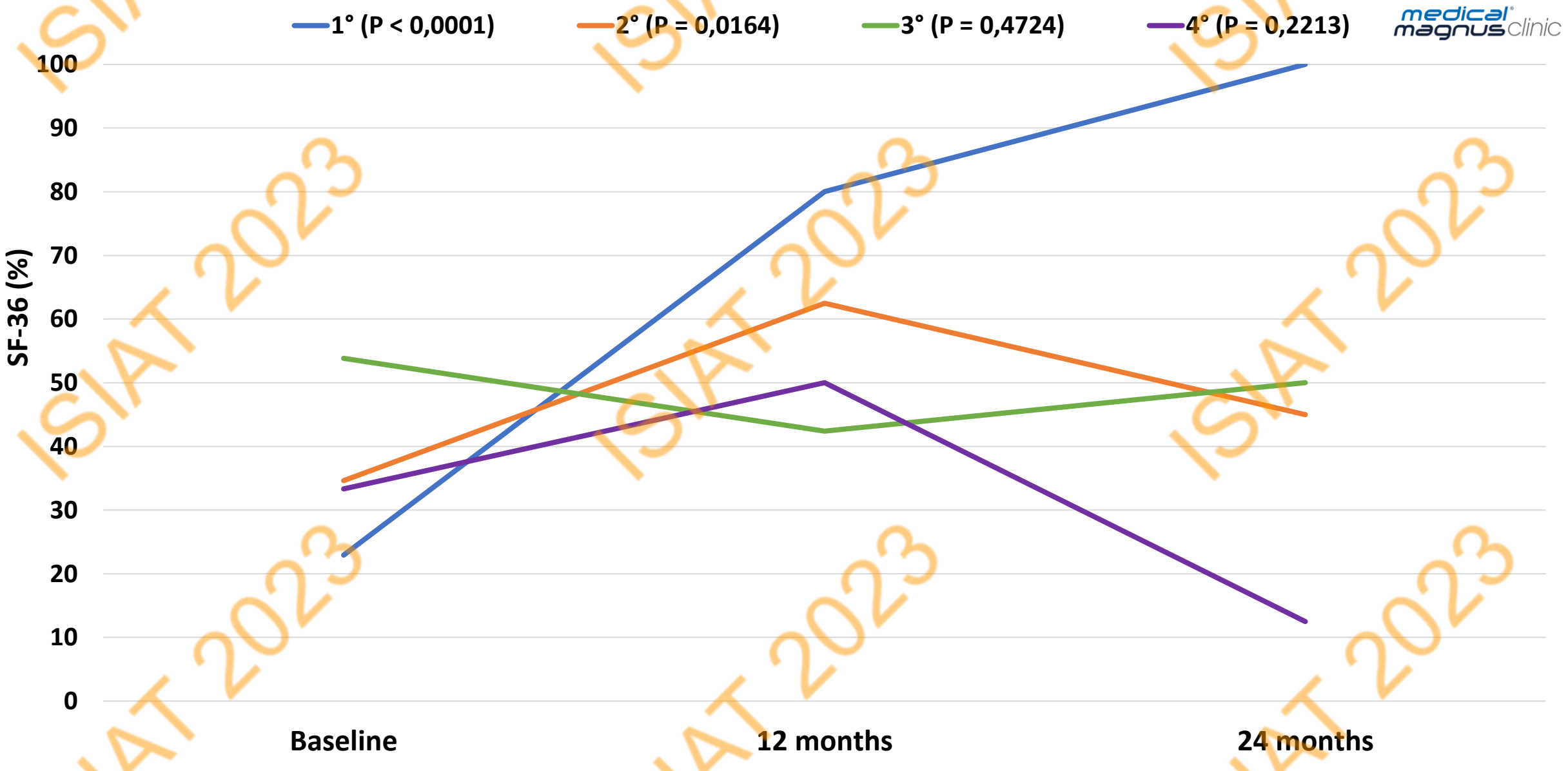
SF-36. Physical Functioning (%)



SF-36. Role Limitations Due To Physical Health (%)

Time Point	Degree of degeneration	Statistical parameter			
		M	*SD*	*Me*	*p-value*
Baseline (t_0)	1°	22,92	22,51	25,00	
	2°	34,62	38,78	25,00	
	3°	53,85	36,53	50,00	
	4°	33,33	37,64	25,00	
12 months (t_{12})	1°	80,00	42,16	100,00	
	2°	62,50	44,15	100,00	
	3°	42,39	42,93	25,00	
	4°	50,00	30,62	50,00	
24 months (t_{24})	1°	100,0	0,00	100,00	< 0,0001
	2°	45,00	42,16	37,50	= 0,0164
	3°	50,00	44,32	37,50	= 0,4724
	4°	12,50	17,68	12,50	= 0,2213

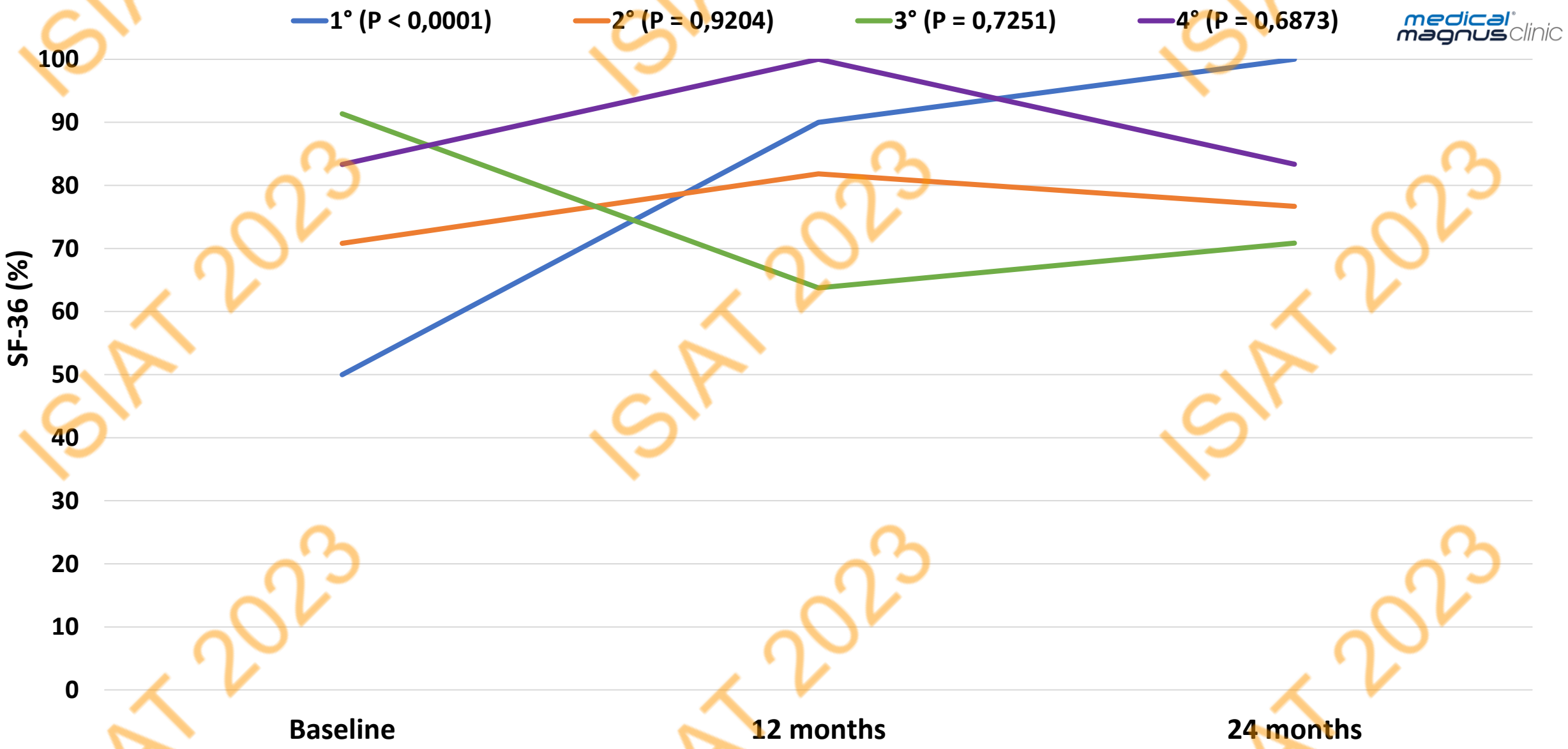
SF-36. Role Limitations Due To Physical Health (%)



SF-36. Role Limitations Due To Emotional Health (%)

Time Point	Degree of degeneration	Statistical parameter			
		M	*SD*	*Me*	*p-value*
Baseline (t_0)	1°	50,00	52,22	50,00	
	2°	70,83	39,25	100,00	
	3°	91,35	17,39	100,00	
	4°	83,33	27,90	100,00	
12 months (t_{12})	1°	90,00	31,62	100,00	
	2°	81,82	39,48	100,00	
	3°	63,76	47,05	100,00	
	4°	100,00	0,00	100,00	
24 months (t_{24})	1°	100,00	0,00	100,00	< 0,0001
	2°	76,67	41,72	100,00	= 0,9204
	3°	70,84	45,21	100,00	= 0,7251
	4°	83,35	23,55	83,35	= 0,6873

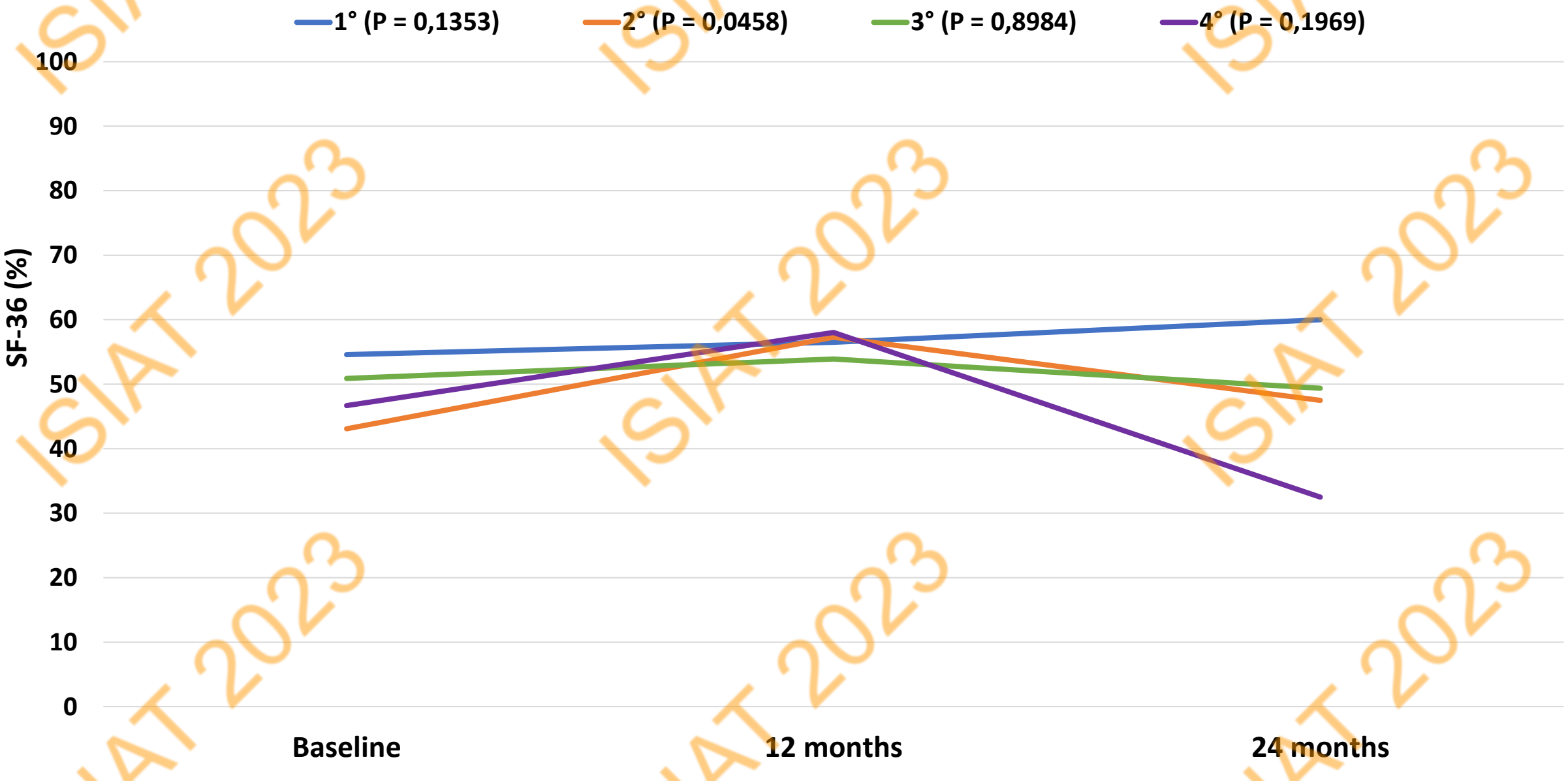
SF-36. Role Limitations Due To Emotional Health (%)



SF-36. Energy & Fatigue (%)

Time Point	Degree of degeneration	Statistical parameter			
		M	*SD*	*Me*	*p-value*
Baseline (t_0)	1°	54,58	17,38	45,00	
	2°	43,08	15,45	45,00	
	3°	50,88	19,51	55,00	
	4°	46,67	12,11	45,00	
12 months (t_{12})	1°	56,50	17,65	55,00	
	2°	57,27	15,41	60,00	
	3°	53,91	22,31	60,00	
	4°	58,00	10,37	55,00	
24 months (t_{24})	1°	60,00	0,00	60,00	= 0,1353
	2°	47,50	12,08	50,00	**= 0,0458**
	3°	49,38	24,70	40,00	= 0,8984
	4°	32,50	3,54	32,50	= 0,1969

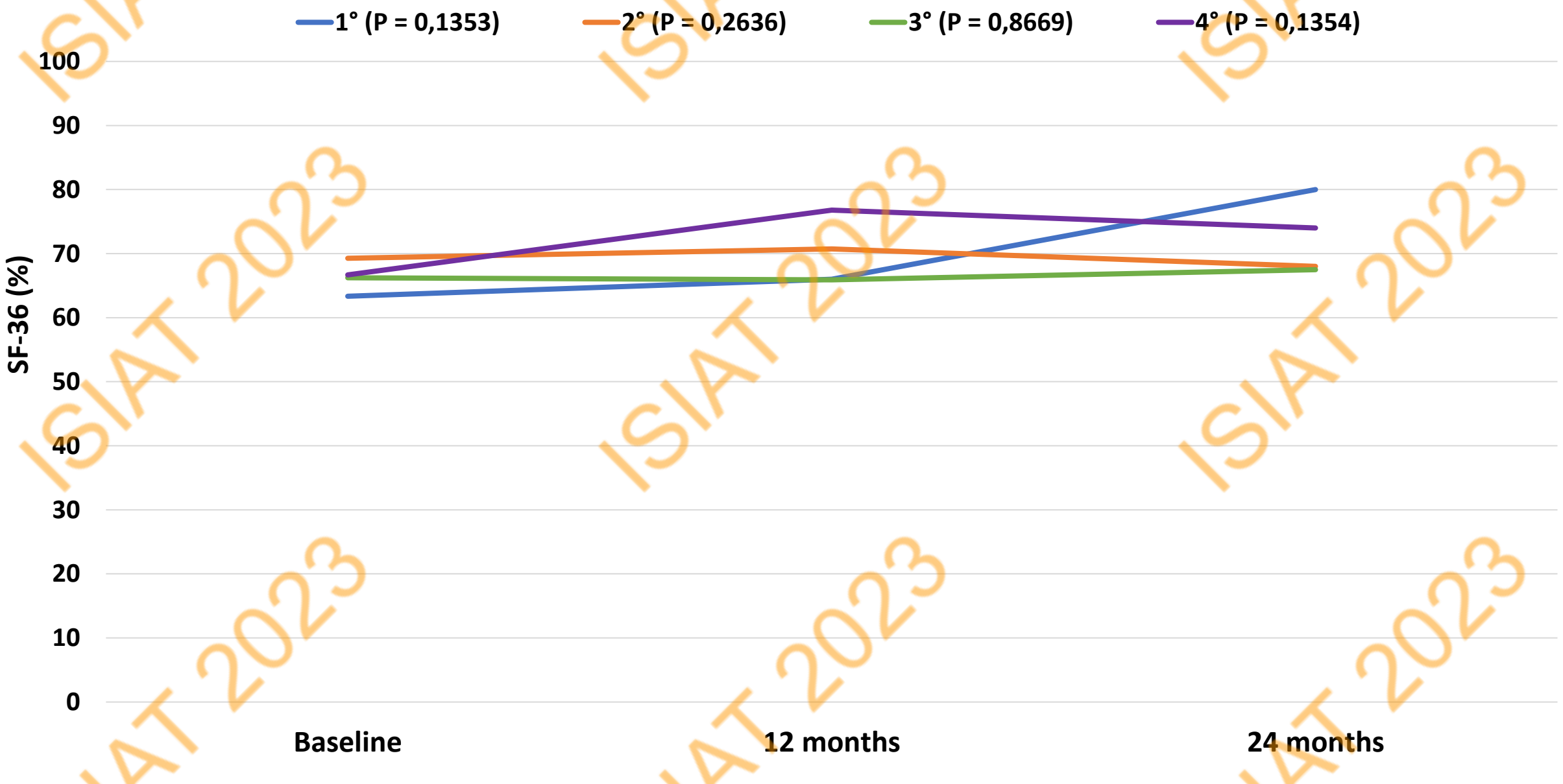
SF-36. Energy & Fatigue (%)



SF-36. Emotional Well-Being (%)

Time Point	Degree of degeneration	Statistical parameter			
		M	*SD*	*Me*	*p-value*
Baseline (t_0)	1°	63,33	16,34	58,00	
	2°	69,26	14,01	68,00	
	3°	66,22	22,58	76,00	
	4°	66,67	13,06	68,00	
12 months (t_{12})	1°	66,00	8,06	66,00	
	2°	70,73	14,99	72,00	
	3°	65,91	24,21	72,00	
	4°	76,80	17,06	80,00	
24 months (t_{24})	1°	80,00	0,00	80,00	= 0,1353
	2°	68,00	16,86	66,00	= 0,2636
	3°	67,50	16,20	64,00	= 0,8669
	4°	74,00	25,46	74,00	= 0,1354

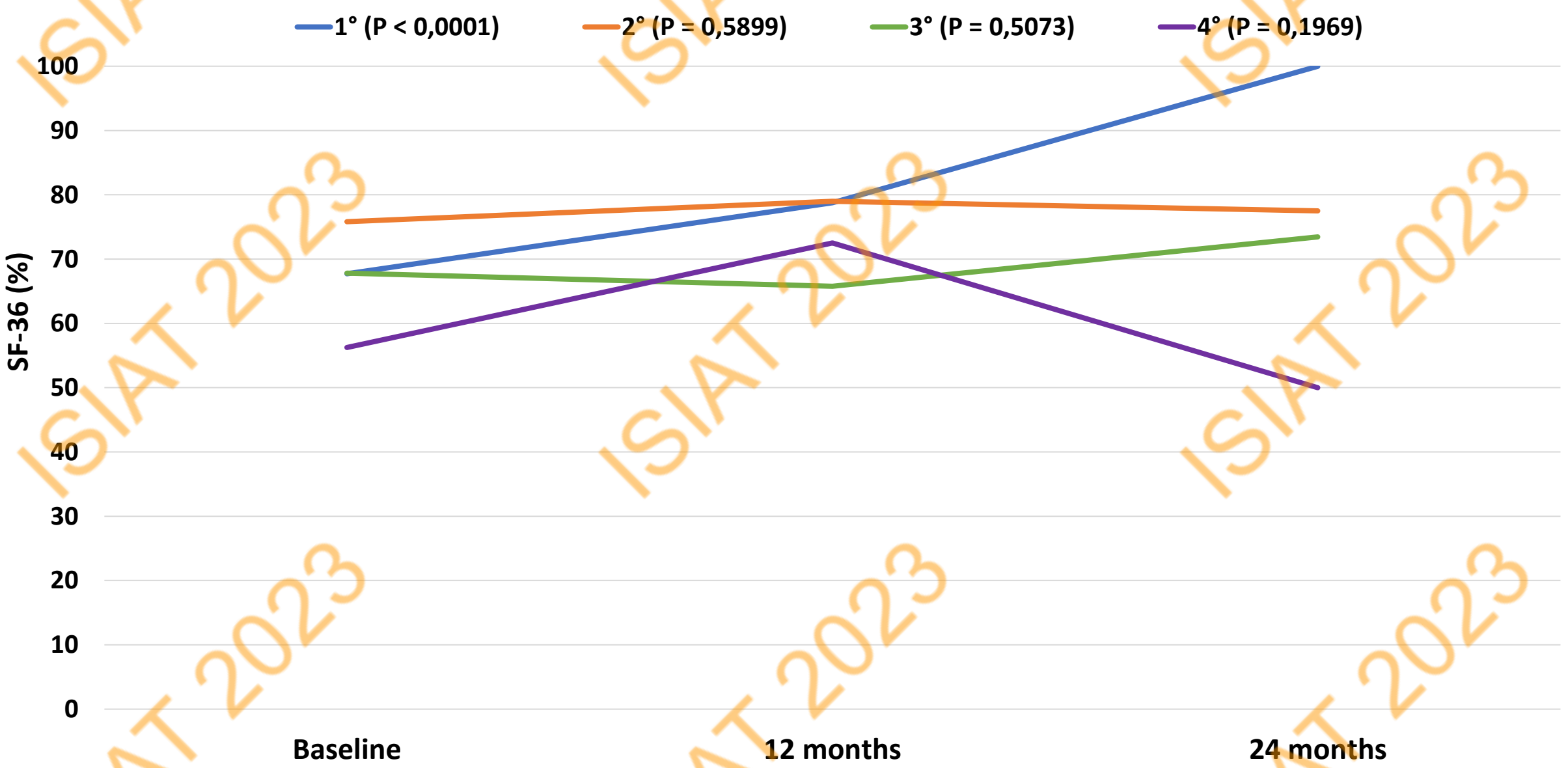
SF-36. Emotional Well-Being (%)



SF-36. Social Functioning (%)

Time Point	Degree of degeneration	Statistical parameter			
		M	*SD*	*Me*	*p-value*
Baseline (t_0)	1°	67,71	25,26	62,50	
	2°	75,80	23,89	75,00	
	3°	67,80	30,77	75,00	
	4°	56,25	32,35	50,00	
12 months (t_{12})	1°	78,75	21,29	81,25	
	2°	78,98	15,62	75,00	
	3°	65,76	27,49	75,00	
	4°	72,50	18,54	75,00	
24 months (t_{24})	1°	100,00	0,00	100,00	< 0,0001
	2°	77,50	24,15	87,50	= 0,5899
	3°	73,44	21,59	75,00	= 0,5073
	4°	50,00	0,00	50,00	= 0,1969

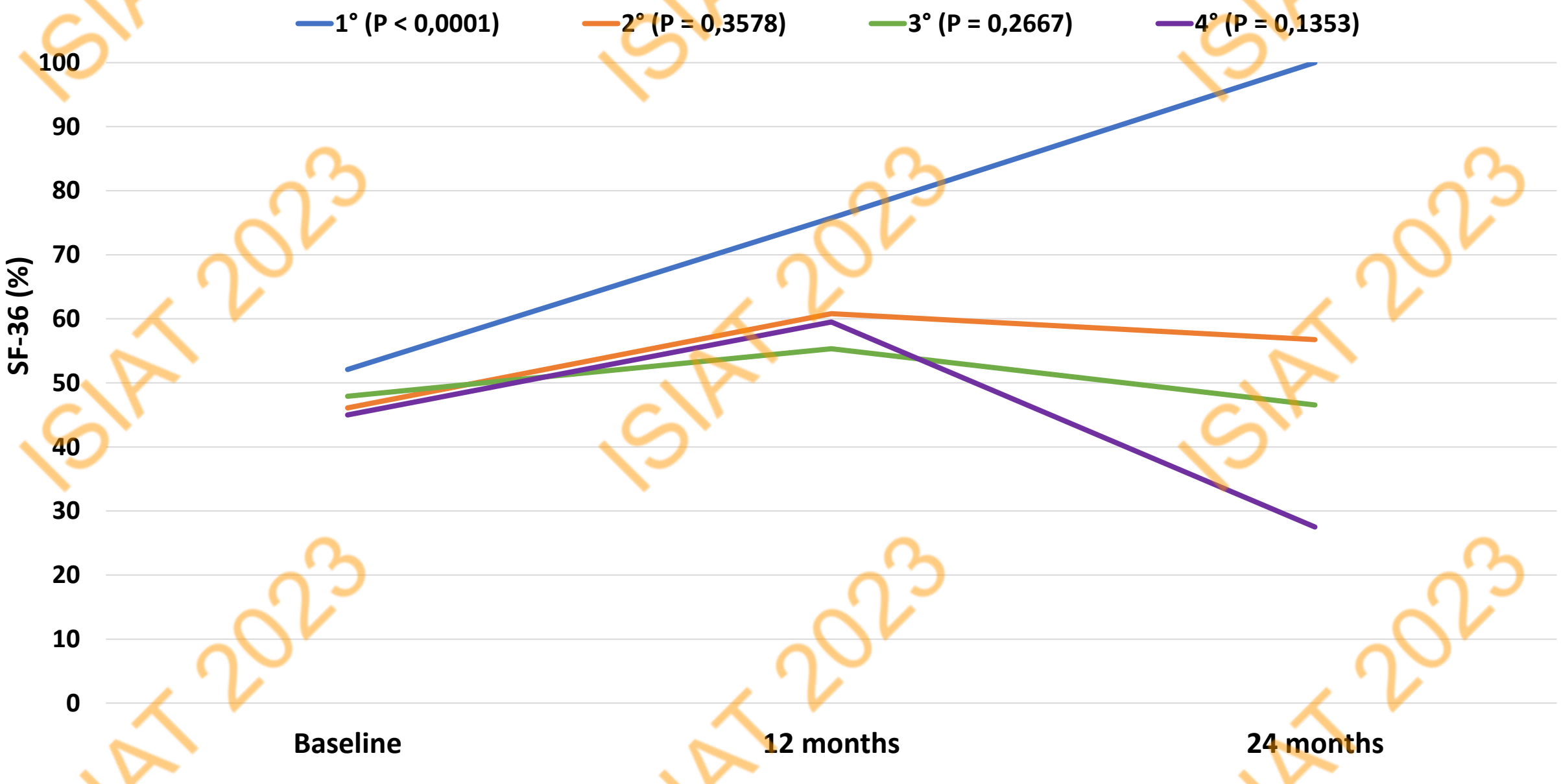
SF-36. Social Functioning (%)



SF-36. Pain (%)

Time Point	Degree of degeneration	Statistical parameter			
		M	*SD*	*Me*	*p-value*
Baseline (t_0)	1°	52,08	27,36	45,00	
	2°	46,10	25,40	45,00	
	3°	47,90	30,26	45,00	
	4°	45,00	27,88	35,00	
12 months (t_{12})	1°	75,75	28,46	83,75	
	2°	60,80	19,39	67,50	
	3°	55,33	25,64	55,00	
	4°	59,50	18,82	55,00	
24 months (t_{24})	1°	100,00	0,00	100,00	< 0,0001
	2°	56,75	26,93	45,00	= 0,3578
	3°	46,56	22,24	40,00	= 0,2667
	4°	27,50	7,07	27,50	= 0,1353

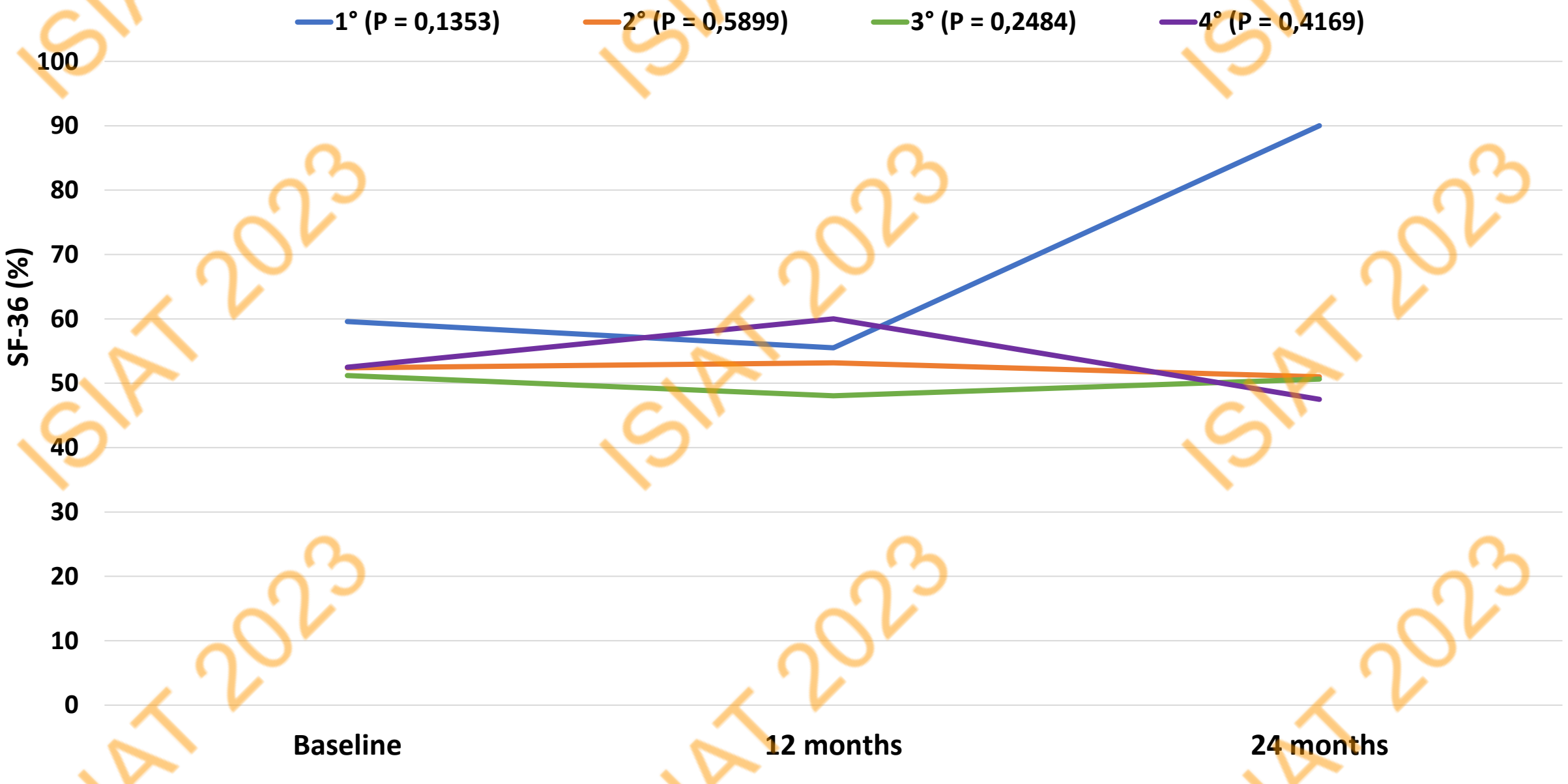
SF-36. Pain (%)



SF-36. General Health (%)

Time Point	Degree of degeneration	Statistical parameter			
		M	*SD*	*Me*	*p-value*
Baseline (t_0)	1°	59,58	17,77	57,50	
	2°	52,40	11,28	55,00	
	3°	51,20	20,07	55,00	
	4°	52,50	13,32	50,00	
12 months (t_{12})	1°	55,50	22,78	55,00	
	2°	53,18	9,82	55,00	
	3°	48,04	21,57	50,00	
	4°	60,00	11,73	65,00	
24 months (t_{24})	1°	90,00	0,00	90,00	< 0,0001
	2°	51,00	16,80	55,00	= 0,5899
	3°	50,63	22,43	45,00	= 0,2484
	4°	47,50	31,82	47,50	= 0,4169

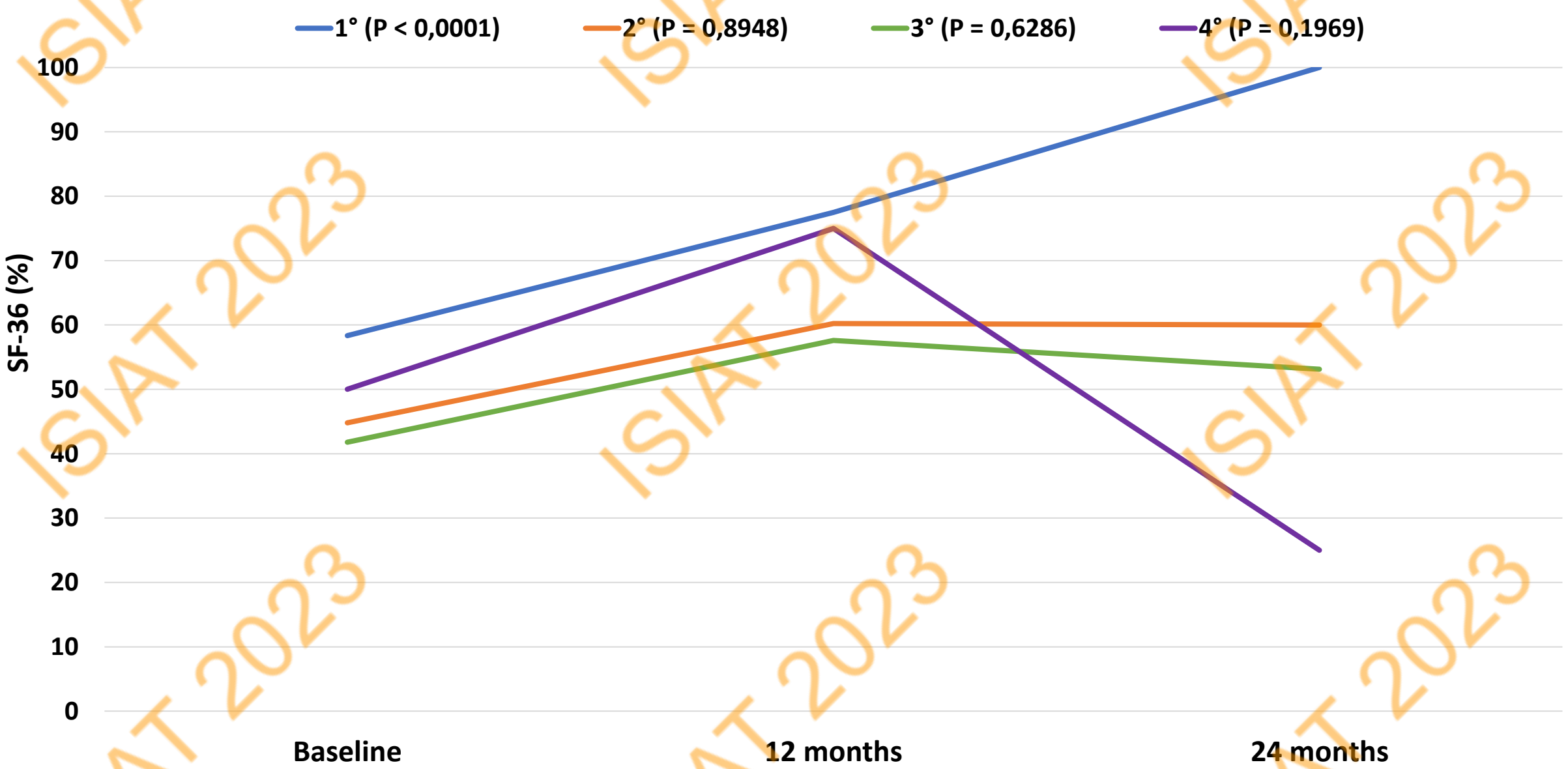
SF-36. General Health (%)



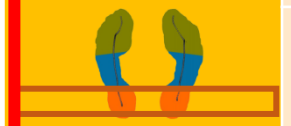
SF-36. Health Change (%)

Time Point	Degree of degeneration	Statistical parameter			
		M	*SD*	*Me*	*p-value*
Baseline (t_0)	1°	58,33	32,57	50,00	
	2°	44,80	23,47	50,00	
	3°	41,80	25,28	50,00	
	4°	50,00	27,39	50,00	
12 months (t_{12})	1°	77,50	32,17	87,50	
	2°	60,23	23,98	75,00	
	3°	57,61	27,63	75,00	
	4°	75,00	17,68	75,00	
24 months (t_{24})	1°	100,00	0,00	100,00	< 0,0001
	2°	60,00	29,34	62,50	= 0,8948
	3°	53,13	31,16	50,00	= 0,6286
	4°	25,00	0,00	25,00	= 0,1969

SF-36. Health Change (%)



Feet Peak Force Pressure on the Ground (n)

Anatomy	Time Point	Post-operative rehablitation	Statistical parameter							
			M		*SD*		*Me*		*p-values*	
		Foot	R	L	R	L	R	L	R	L
Initial contact 	t_0	No	536,5	575,9	44,0	89,0	543,9	576,1		
		Yes	492,8	533,0	117,0	134,2	533,4	562,8		
	t_{12}	No	578,2	553,2	101,8	112,5	578,3	578,1	< 0,0001	< 0,0001
		Yes	550,5	577,6	85,8	125,5	559,0	619,3	< 0,0001	< 0,0001
Midstance 	t_0	No	123,2	132,5	75,6	62,9	107,4	119,0		
		Yes	149,8	166,6	79,8	113,2	148,1	149,8		
	t_{12}	No	138,8	141,7	79,2	90,6	127,0	115,6	= 0,0213	= 0,0075
		Yes	166,6	176,6	123,6	146,1	158,5	138,0	< 0,0001	= 0,0002
Terminal stance 	t_0	No	796,8	812,2	69,5	89,6	789,3	802,0		
		Yes	733,7	667,4	144,5	200,9	729,3	691,7		
	t_{12}	No	694,0	715,1	271,4	278,9	758,1	833,4	< 0,0001	< 0,0001
		Yes	785,4	814,7	143,5	127,8	829,8	836,7	< 0,0001	< 0,0001

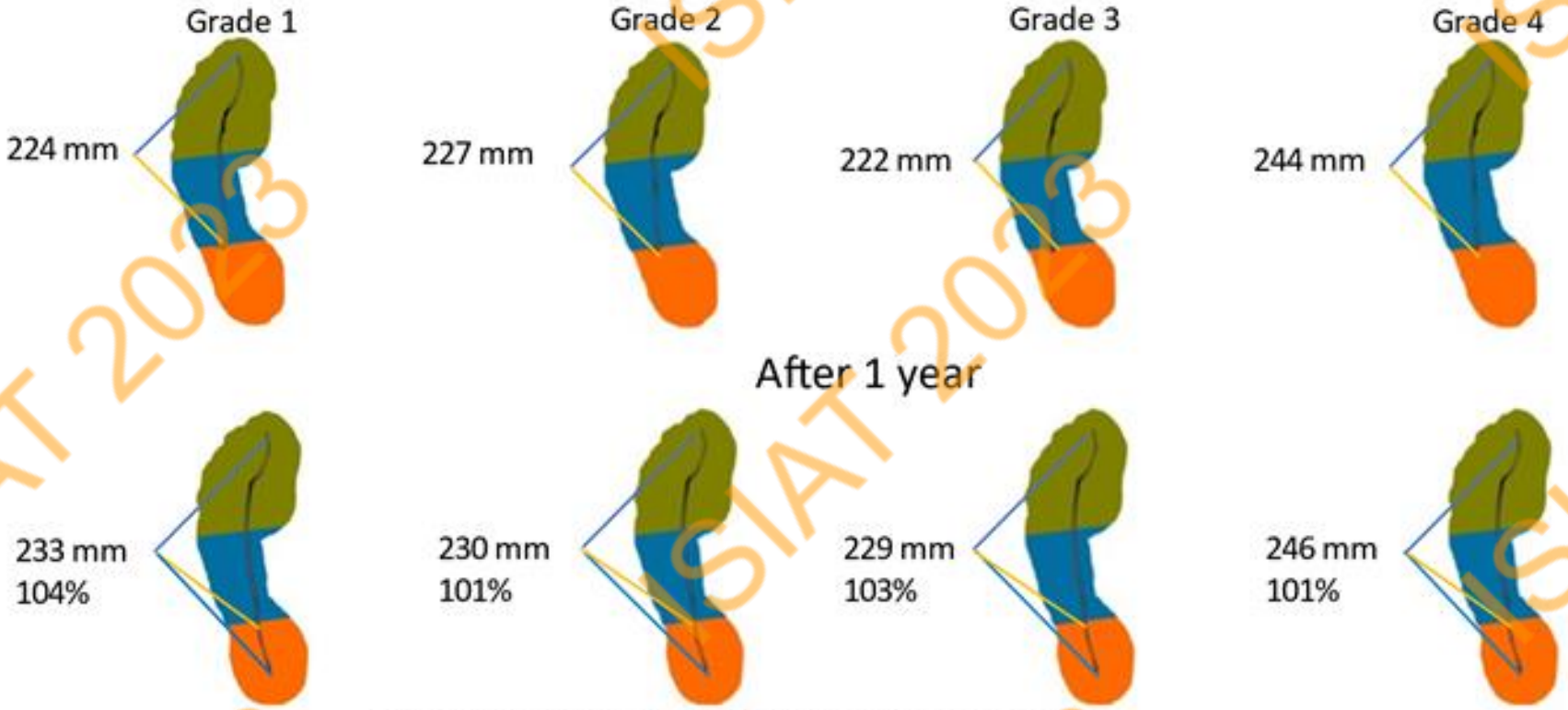
We also assessed the behavior of the lower limbs during walking. In the load phase, we measured the pressure on the ground, as well as the length of the foot load for the left and right lower limbs. **We observed a greater emphasis in the group of rehabilitated patients**.

Feet Soles Lenght Contact with the Ground (mm)

Time Point	Postoperative rehabilitation	Statistical parameter							
		M		*SD*		*Me*		*p-values*	
	Foot	R	L	R	L	R	L	R	L
Baseline (t_0)	No	**231,3**	**228,4**	15,0	19,6	229	236		
	Yes	223,4	224,9	19,2	16,3	226	228		
12 months (t_{12})	No	**236,0**	**239,4**	12,0	7,8	238	240	< 0,0001	= 0,0006
	Yes	229,0	228,7	16,7	13,2	232	232	< 0,0001	< 0,0001

An indicator that undoubtedly confirms the improvement in the functioning of patients after administration of CD-34 + stem cells is the length of WB on the foot, which has significantly improved in both the right and left limbs. The change is important.

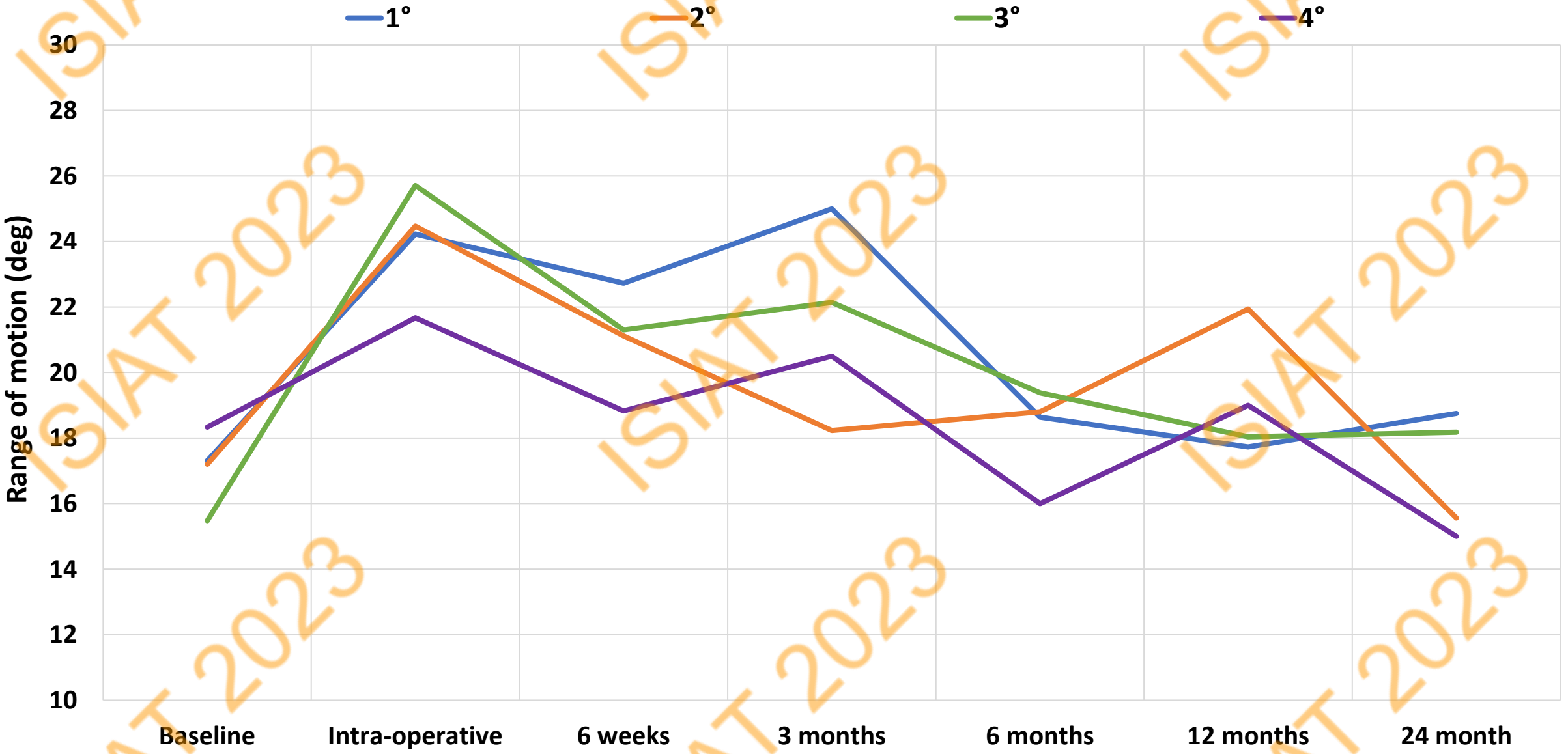
Lenght of Foot Contact with the Ground



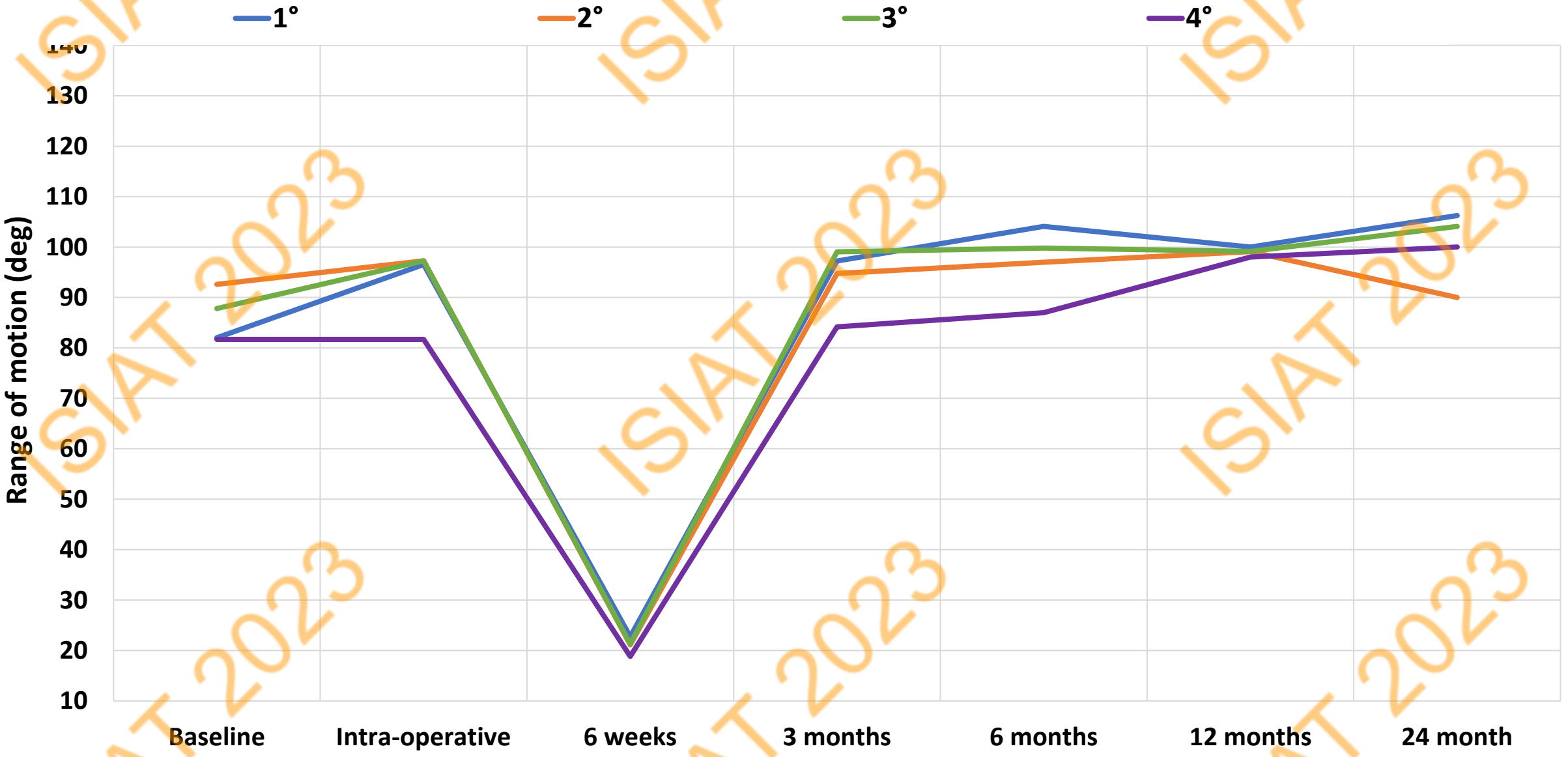
LENGTH OF GAIT LINE (mm) DURING THE 12 MONTH FOLLOWUP

Time Point	Degree of degeneration	Statistical parameter			
		M	*SD*	*Me*	*p-value*
Baseline (t_0)	1°	224,43	9,68	222,00	
	2°	226,57	15,66	227,00	
	3°	221,88	20,65	227,00	
	4°	243,75	6,20	242,50	
12 months (t_{12})	1°	233,07	9,65	234,50	**0,0018**
	2°	229,60	13,28	232,00	0,0537
	3°	229,26	15,84	234,50	**0,0001**
	4°	245,63	4,57	244,50	0,0702

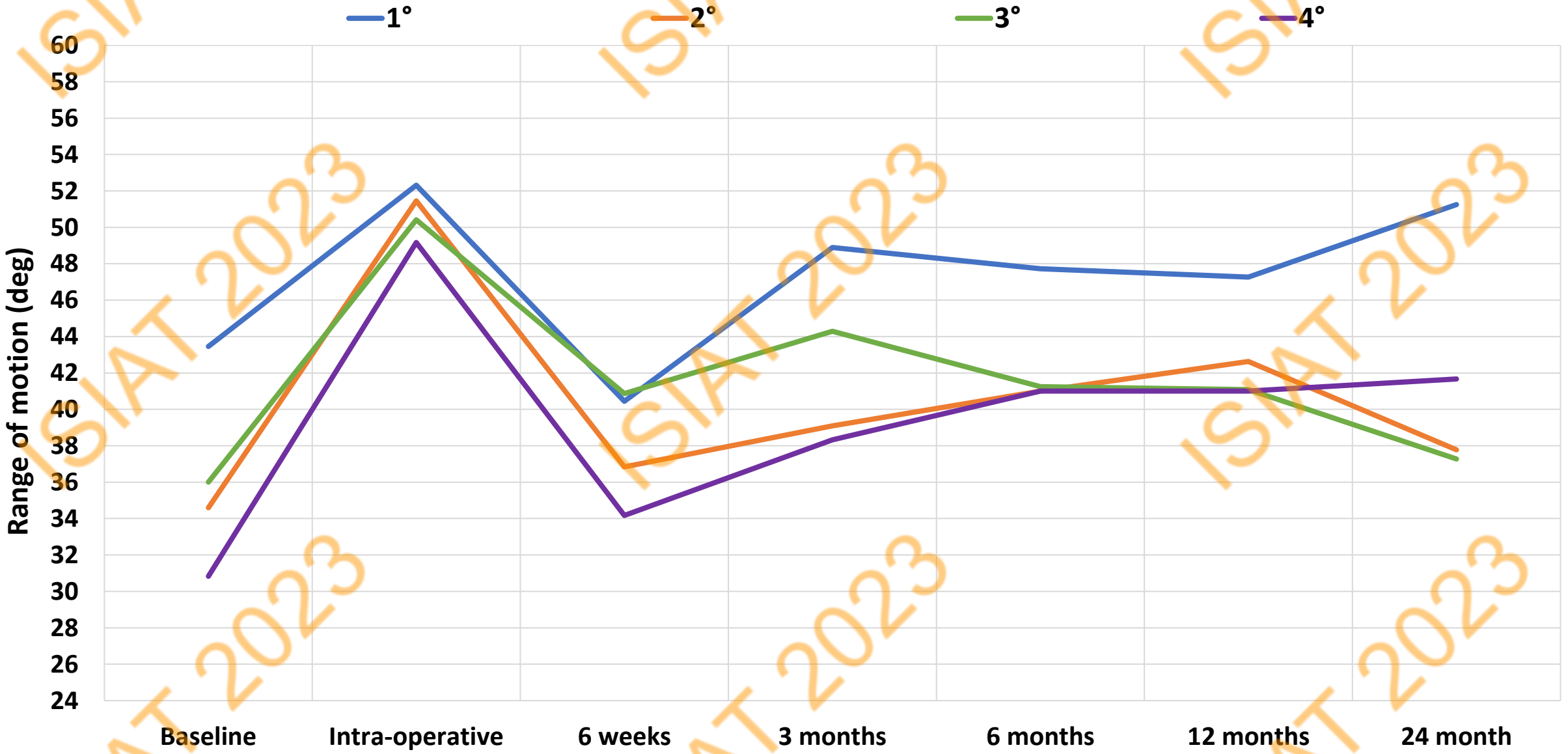
Range of Extension (deg) –in the Starting Position acc. to Kellgren-Lawrence grade scale



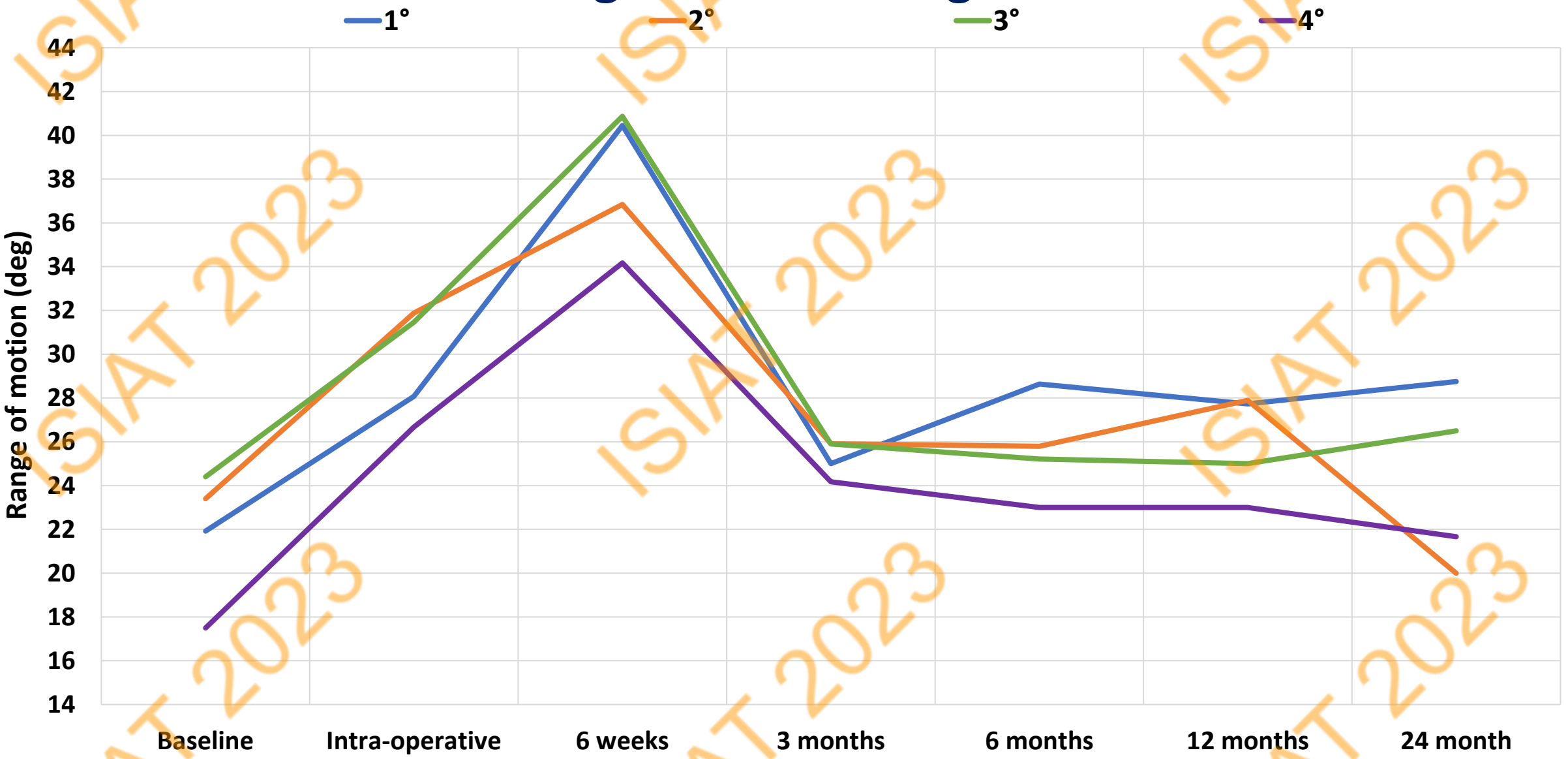
Range of Flexion (deg) –in the Starting Position acc. to Kellgren-Lawrence grade scale



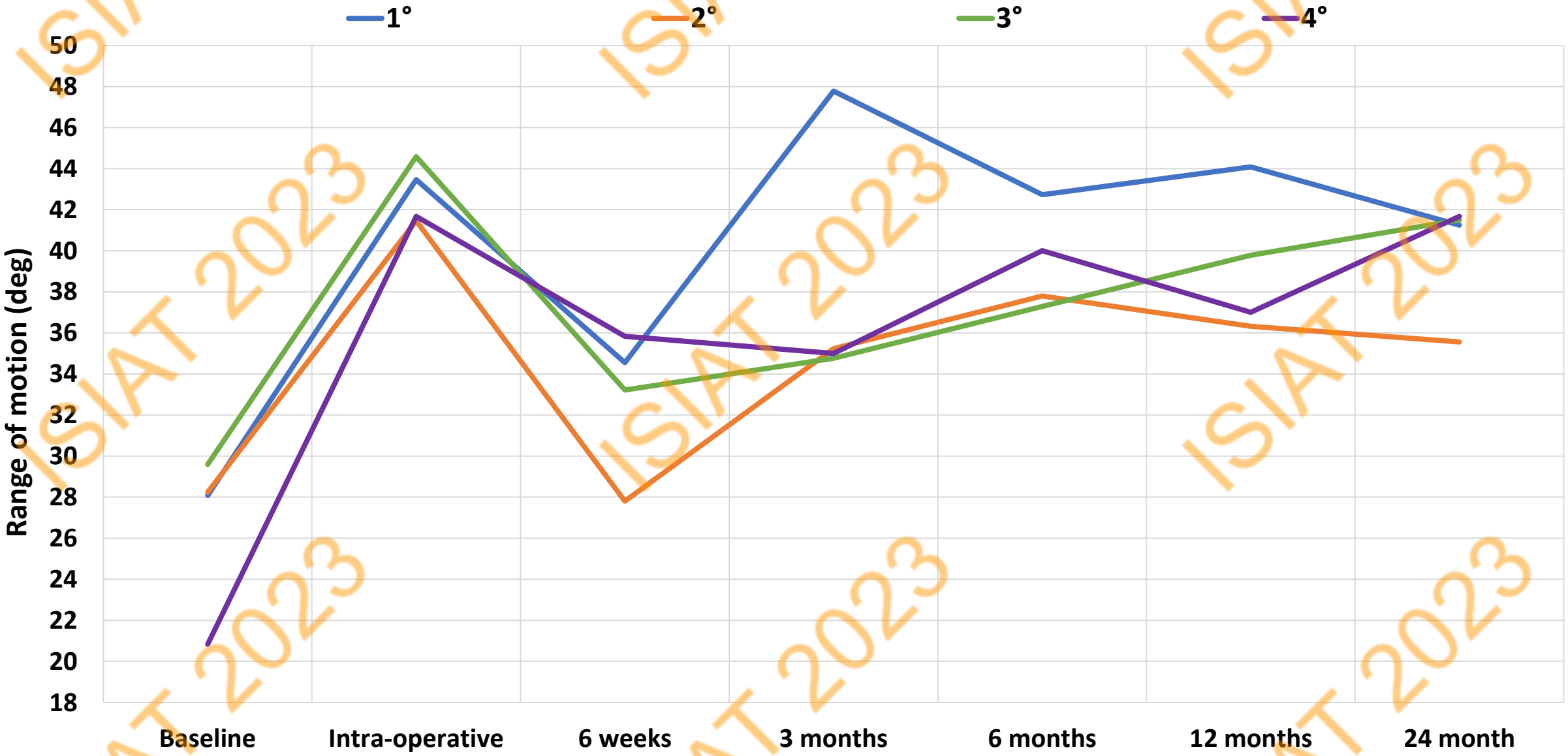
Range of Abduction (deg) –in the Starting Position acc. to Kellgren-Lawrence grade scale



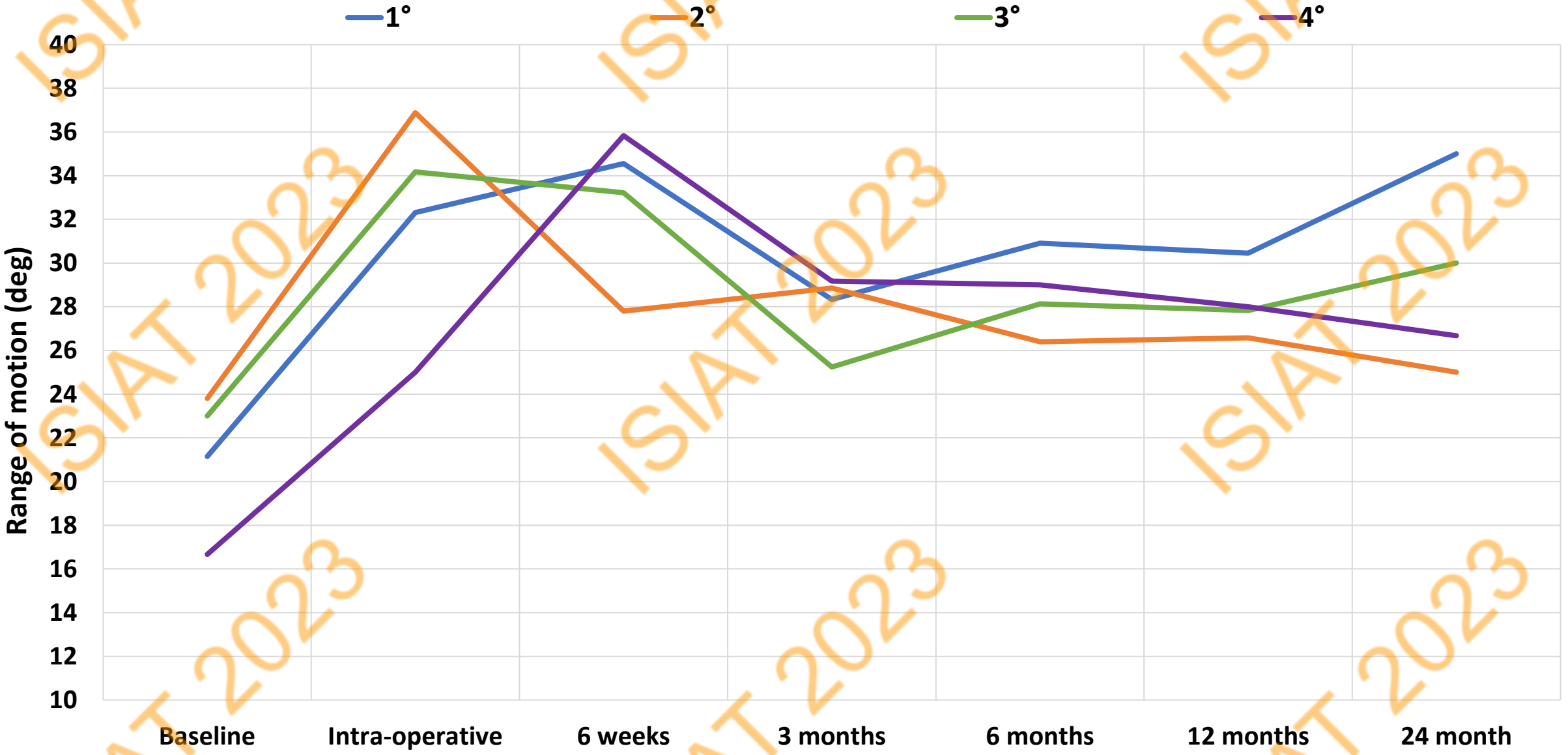
Range of Adduction (deg) –in the Starting Position acc. to Kellgren-Lawrence grade scale



Range of External Rotation (deg) –in the Starting Position acc. to Kellgren-Lawrence grade scale



Range of Internal Rotation (deg) –in the Starting Position acc. to Kellgren-Lawrence grade scale

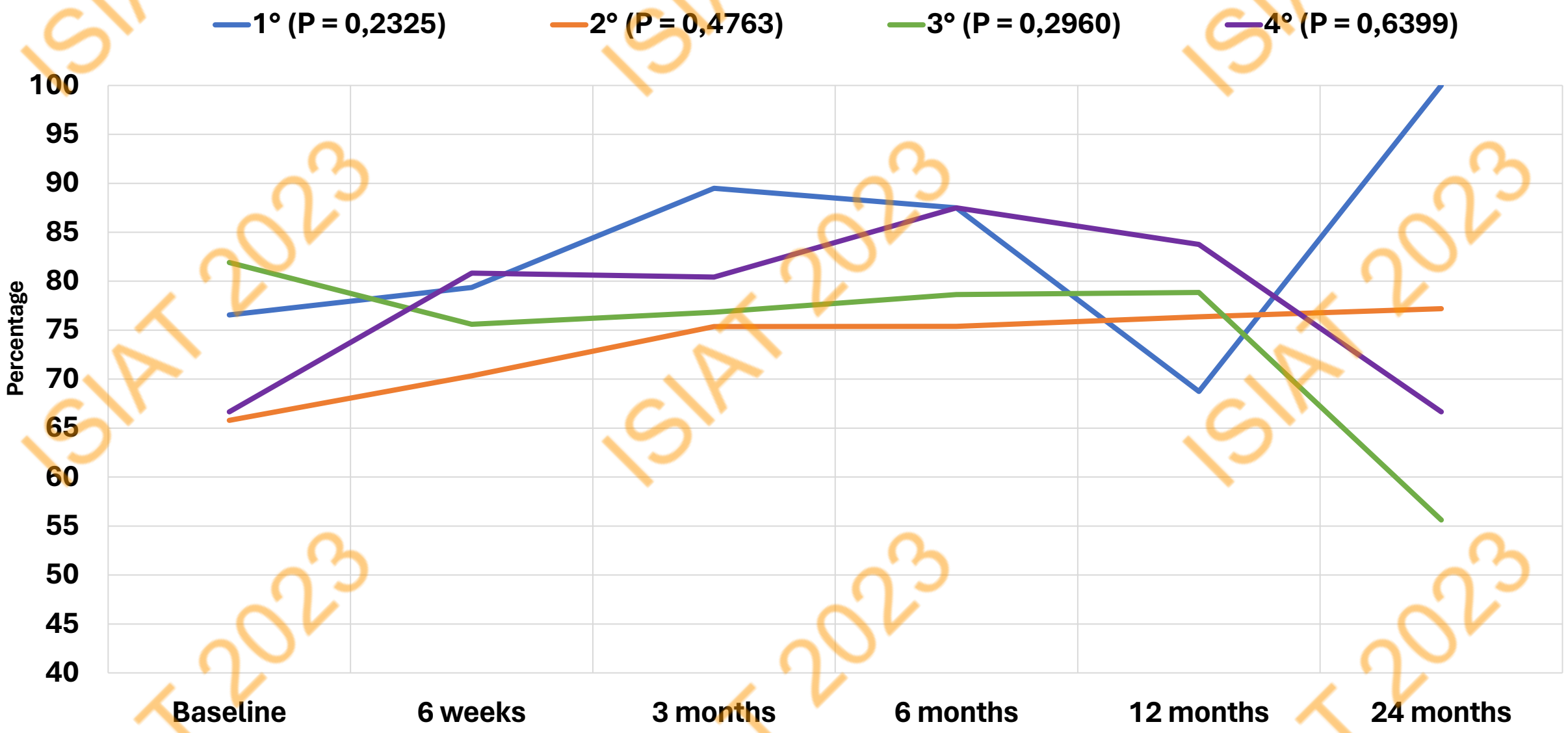


HOOS. Pain (%)

Time Point	Degree of degeneration											
	1°			2°			3°			4°		
	M	*SD*	*Me*	*M*	*SD*	*Me*	*M*	*SD*	*Me*	*M*	*SD*	*Me*
Baseline	76,56	24,60	82,50	65,80	21,86	70,00	81,90	18,74	90,00	66,67	29,01	62,50
6 weeks	79,37	19,58	77,50	70,33	18,48	67,50	75,60	19,87	75,00	80,83	17,65	82,50
3 months	89,50	18,40	100,00	75,38	24,10	80,00	76,84	21,49	87,50	80,42	25,86	88,75
6 months	87,50	15,29	95,00	75,40	18,97	75,00	78,65	18,16	81,25	87,50	15,10	92,50
12 months	68,75	12,02	75,00	76,36	23,17	80,00	78,85	23,85	85,00	83,75	16,71	83,75
24 months	100,00	10,00	100,00	77,19	23,96	85,00	55,63	16,50	55,00	66,67	38,19	75,00
P-value	**P = 0,2325**			**P = 0,4763**			**P = 0,2960**			**P = 0,6399**		

(M – mean; Me – median; SD – standard deviation.)*

HOOS. Pain

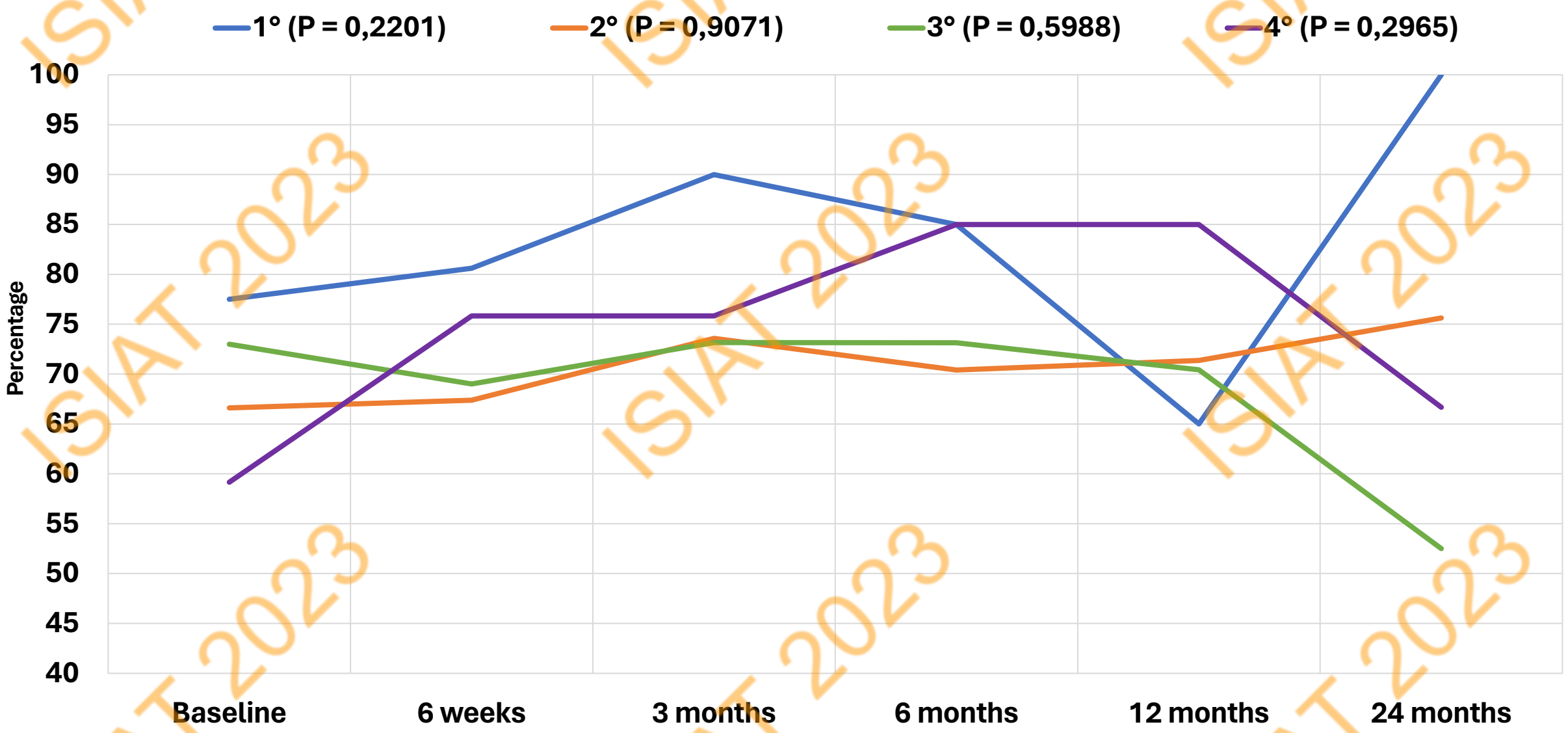


HOOS. Symptoms And Stiffness

Time Point	Degree of degeneration											
	1°			2°			3°			4°		
	M	*SD*	*Me*	*M*	*SD*	*Me*	*M*	*SD*	*Me*	*M*	*SD*	*Me*
Baseline	77,50	25,21	85,00	66,60	24,14	75,00	73,00	22,08	80,00	59,17	26,35	57,50
6 weeks	80,62	19,90	82,50	67,39	23,78	70,00	69,00	19,53	70,00	75,83	20,35	75,00
3 months	90,00	17,32	100,00	73,57	25,60	75,00	73,16	21,93	85,00	75,83	24,98	85,00
6 months	85,00	16,48	87,50	70,40	24,49	75,00	73,13	17,50	75,00	85,00	13,23	90,00
12 months	65,00	18,17	75,00	71,36	30,48	77,50	70,42	26,82	75,00	85,00	11,83	80,00
24 months	100,00	10,00	100,00	75,62	23,37	82,50	52,50	28,43	52,50	66,67	25,16	70,00
P-value	P = 0,2201			P = 0,9071			P = 0,5988			P = 0,2965		

(M – mean; Me – median; SD – standard deviation.)*

HOOS. Symptoms And Stiffness

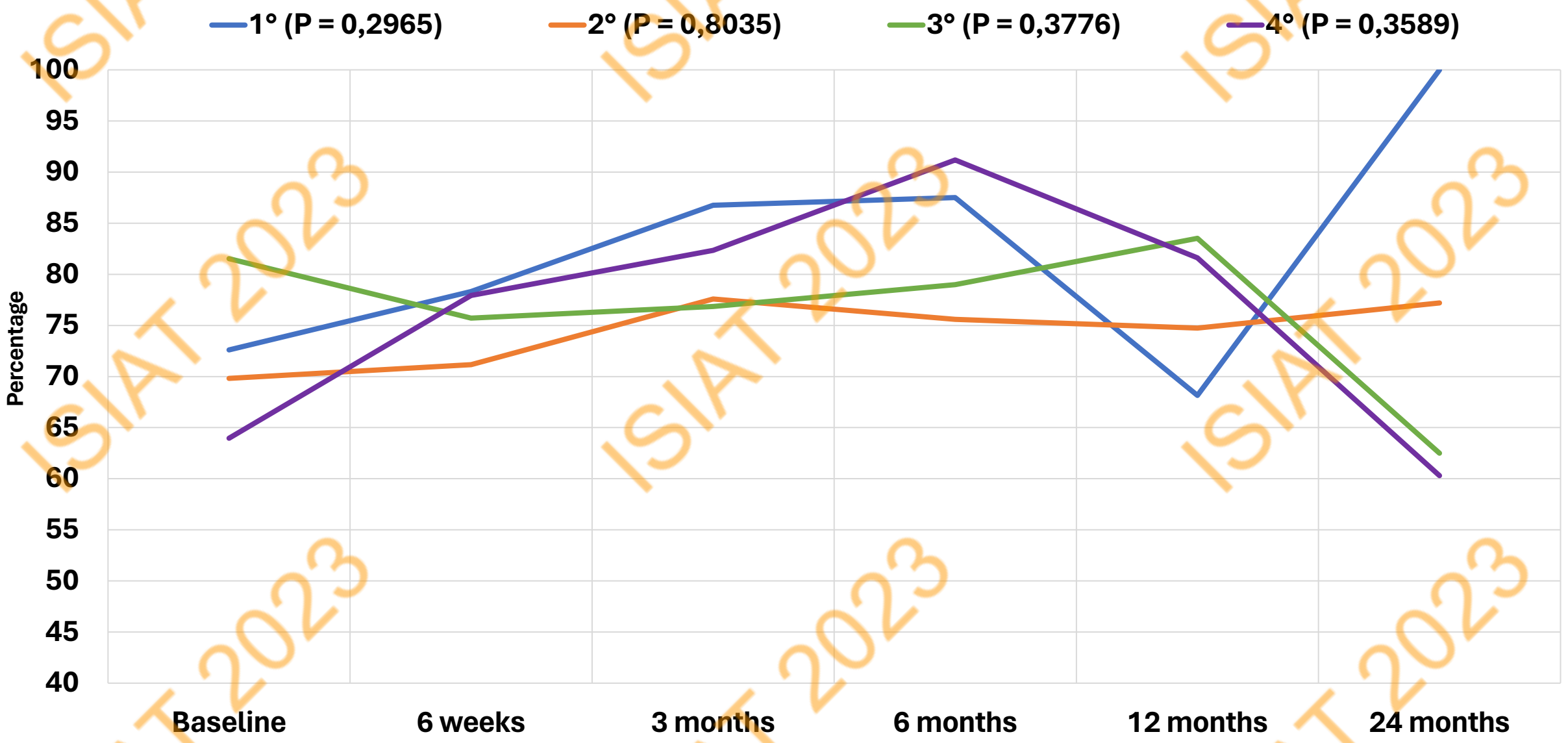


HOOS. Activities of Daily Living (%)

Time Point	Degree of degeneration											
	1°			2°			3°			4°		
	M	*SD*	*Me*	*M*	*SD*	*Me*	*M*	*SD*	*Me*	*M*	*SD*	*Me*
Baseline	72,61	29,14	79,41	69,82	20,99	77,94	81,53	18,12	85,29	63,97	29,66	57,36
6 weeks	78,31	19,52	78,68	71,16	18,32	66,18	75,71	22,00	73,53	77,94	20,72	81,62
3 months	86,76	20,32	98,53	77,59	19,36	85,29	76,86	21,00	82,35	82,35	24,61	88,97
6 months	87,50	16,15	95,59	75,59	17,27	76,47	78,98	19,36	80,15	91,18	7,43	95,59
12 months	68,14	11,57	73,53	74,73	28,58	81,62	83,52	18,28	91,18	81,62	17,76	81,62
24 months	100,00	10,00	100,00	77,20	22,98	85,29	62,50	18,77	61,77	60,30	38,15	72,06
P-value	**P = 0,2965**			**P = 0,8035**			**P = 0,3776**			**P = 0,3589**		

(M – mean; Me – median; SD – standard deviation.)*

HOOS. Activities of Daily Living (%)

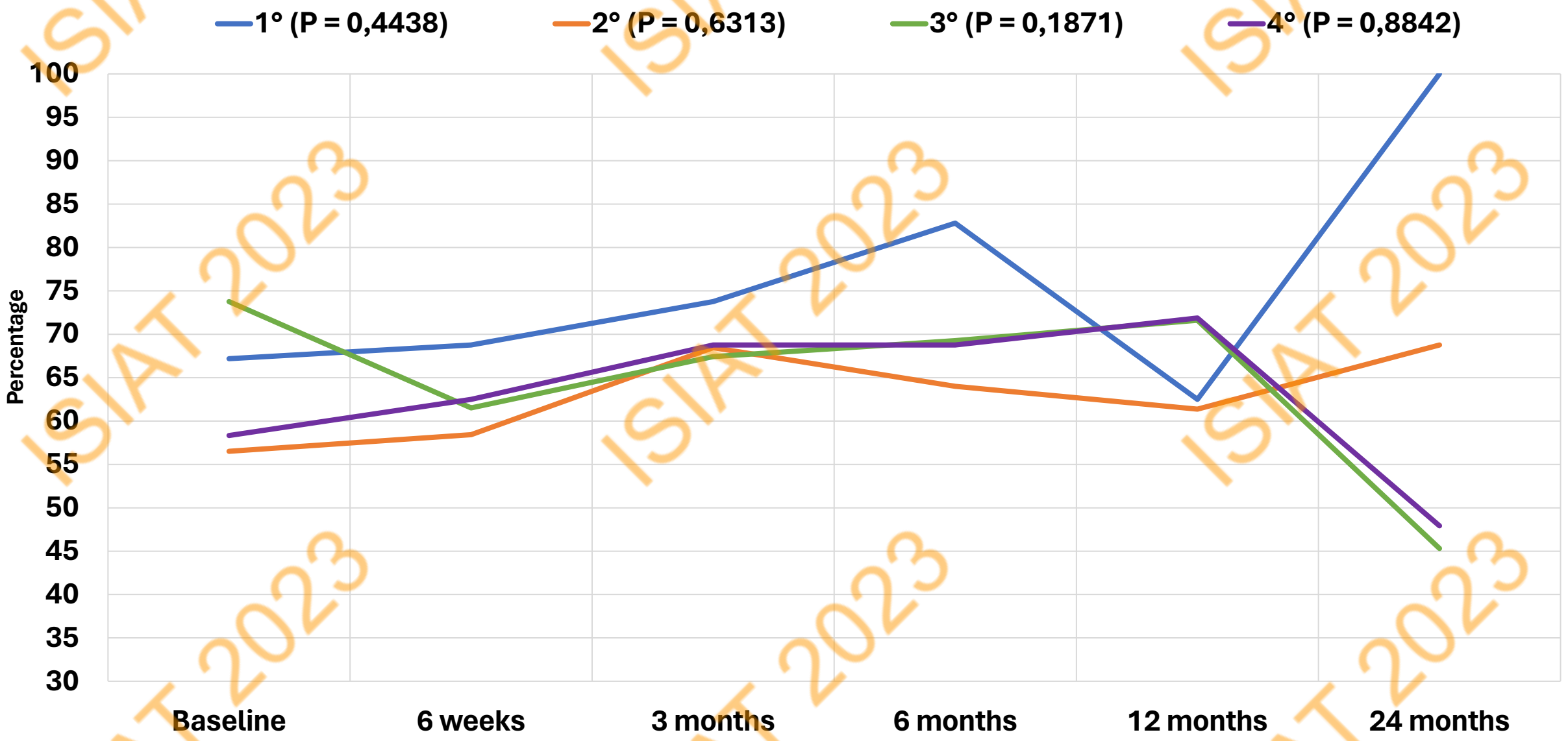


HOOS. Sports Activity and Recreation (%)

Time Point	Degree of degeneration											
	1°			2°			3°			4°		
	M	*SD*	*Me*	*M*	*SD*	*Me*	*M*	*SD*	*Me*	*M*	*SD*	*Me*
Baseline	67,19	30,02	62,50	56,50	26,55	68,75	73,75	23,80	75,00	58,33	34,61	56,25
6 weeks	68,75	23,86	65,63	58,42	22,34	56,25	61,50	25,17	62,50	62,50	31,62	68,75
3 months	73,75	36,01	100,00	68,45	23,34	68,75	67,43	22,88	62,50	68,75	29,58	78,13
6 months	82,81	22,10	87,50	64,00	26,41	75,00	69,27	23,88	71,88	68,75	20,73	75,00
12 months	62,50	19,76	71,88	61,36	30,96	53,13	71,61	21,57	75,00	71,88	28,71	78,13
24 months	100,00	10,00	100,00	68,75	29,88	75,00	45,31	30,35	50,00	47,92	40,66	50,00
P-value	**P = 0,4438**			**P = 0,6313**			**P = 0,1871**			**P = 0,8842**		

(M – mean; Me – median; SD – standard deviation.)*

HOOS. Sports Activity and Recreation (%)

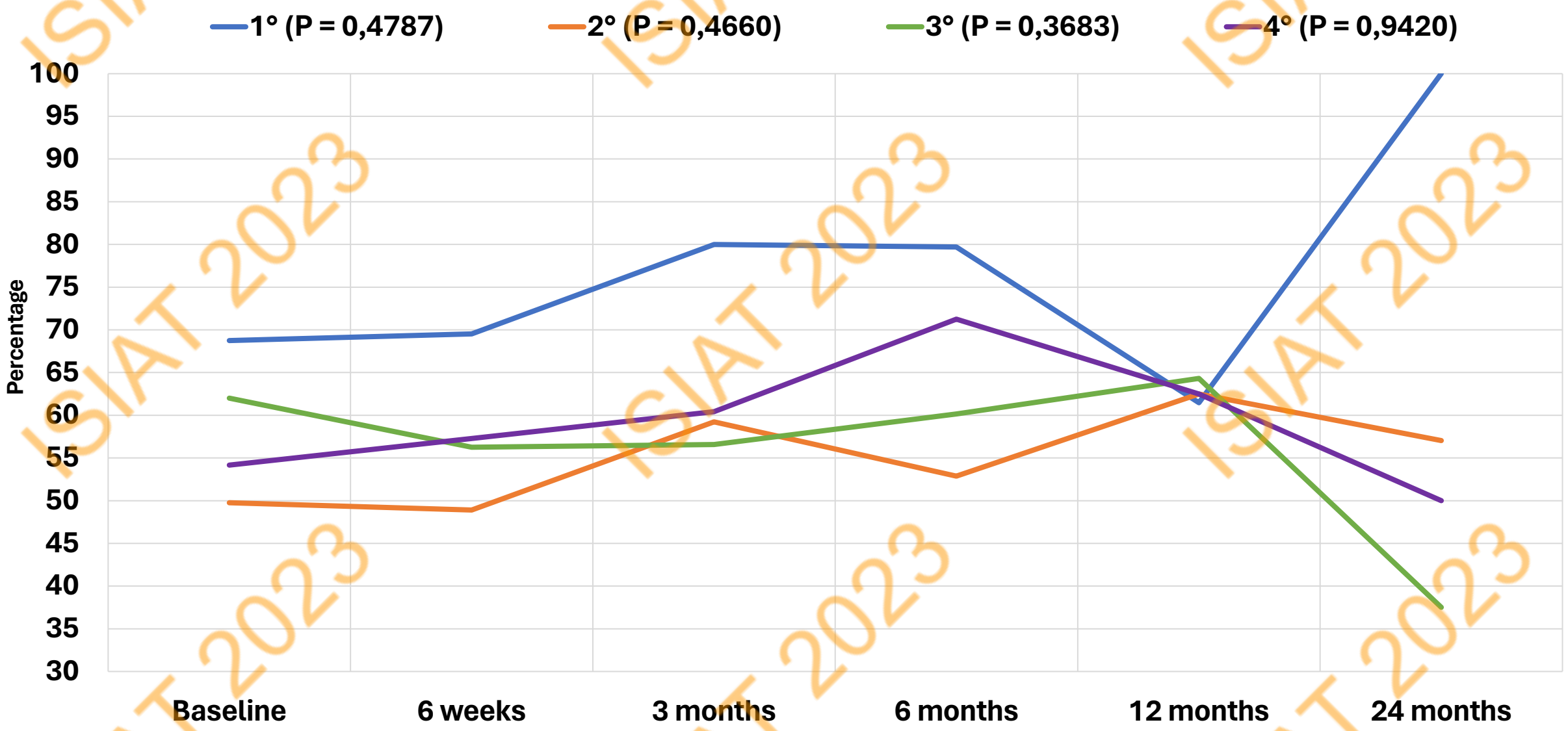


HOOS. Quality of Life (%)

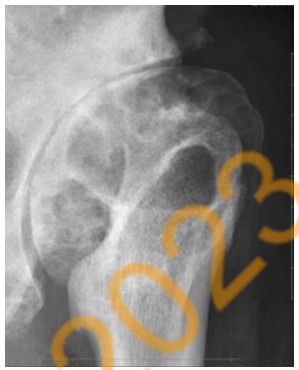
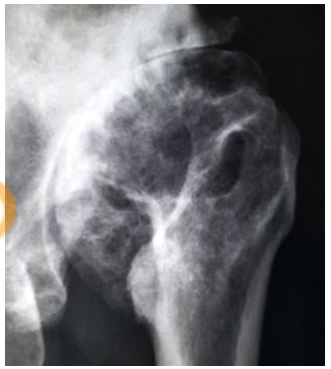
Time Point	Degree of degeneration											
	1°			2°			3°			4°		
	M	*SD*	*Me*	*M*	*SD*	*Me*	*M*	*SD*	*Me*	*M*	*SD*	*Me*
Baseline	68,75	28,93	65,63	49,75	24,10	50,00	62,00	26,69	62,50	54,17	37,43	40,63
6 weeks	69,53	26,82	68,75	48,91	21,70	50,00	56,25	24,67	50,00	57,29	26,34	50,00
3 months	80,00	25,54	93,75	59,23	24,09	62,50	56,58	23,61	50,00	60,42	30,79	62,50
6 months	79,69	23,33	87,50	52,87	29,04	56,25	60,16	20,75	56,25	71,25	19,06	62,50
12 months	61,46	26,34	75,00	62,50	29,69	68,75	64,32	22,23	65,63	62,50	33,07	56,25
24 months	100,00	10,00	100,00	57,03	35,27	56,25	37,50	24,47	40,63	50,00	47,19	43,75
P-value	**P = 0,4787**			**P = 0,4660**			**P = 0,3683**			**P = 0,9420**		

(M – mean; Me – median; SD – standard deviation.)*

HOOS. Quality of Life (%)

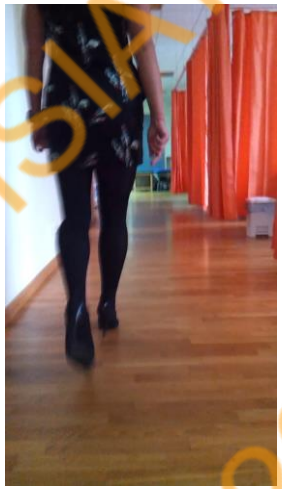


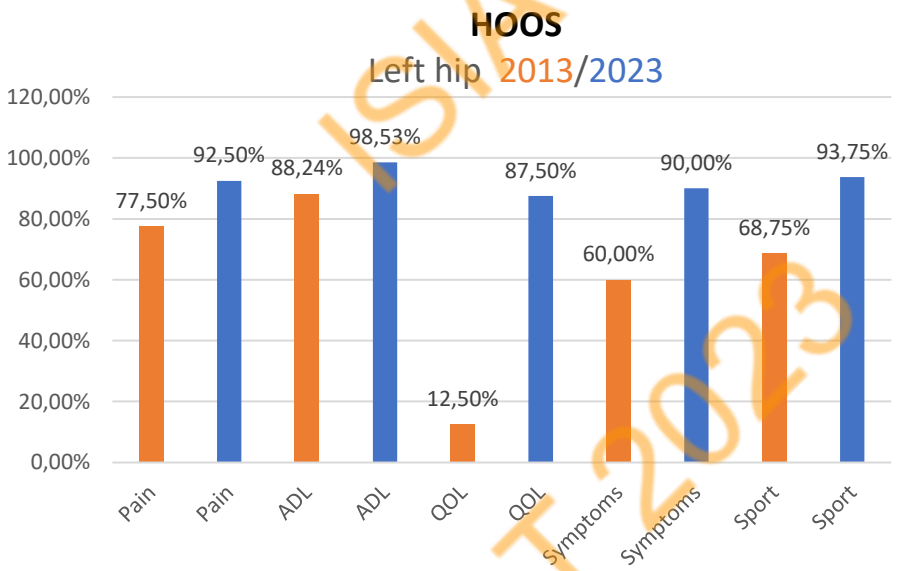
Impossible can be possible




10.2013 05.2014 11.2015 01.2017 03.2018 06.2019 01.2022 **06.2023**



Physiotherapeutic conclusions

- **Spine anesthesia** allows drastically increase ROM, immediately restoring patient's movement capabilities important for everyday living
- **Improved ROM almost in all direction** gives the possibility to perform obligatory 6 weeks-exercise programme (p-value < 0.05)
- **Rehabilitation is an integral part of PHSCs treatment** which significanly improve the quality of life (p-value < 0.05)
- **Improvement of the WB load distribution by lengthening the line of contact between the foot and the ground** - greater in the rehabilitated group (p-value < 0.05)
- **Reduction of pain intensity** - greater in the rehabilitated group (p-value < 0.05)

Radiological conclusions

- **Mostly radiological images does not correspond to clinical findings**
- **Few types of regeneration** are observed:
  - bone/soft tissue together
  - or only bone surface /soft tissue
- After 1 year follow up most patients have inflamation of joint soft tissue – our conception: **regeneration in process**
- **Widening of joint space** – appeared at more than 50% MRI images – we do not know what type of tissue appears? (study in progress)
- After 1 year follow up **leading radiological trend is not observed yet**

Orthopedic conclusions 1/2

- PHSCs are **safe and easy** to obtain by apheresis
- **Collection** of PHSCs from peripherial blood is **less invasive** comparing to i.a. collection from bone marrow
- **No side effects** were observed with the use of Autologous Peripherial, Fresh HSCs CD34 +
- High level of **acceptance** of the treatment process **by patients**
- **The use of fresh HSCs may matter**
- The question is how result of treatment vary depending on the level of OA and quantity of administered PHSCs (study in progress)

Orthopedic conclusions 2/2

- **Administration** of PHSCs to the hip joint should be done **under US-control**
- **Injection or drilling** enables PHSCs administration also **to the soft head femur bone**
- **THA is still possible** if PHSCs treatment is not effective
- 2 years follow up allows to conclude that **1°-2° K-L scale has better prognosis for THA avoidance**
- More conclusions are expected after completion of the 2 years project

Thank you very much for your attention

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