Transportation Environment of Contaminated Instruments before Reprocessing

Karin Bundgaard, Associated Professor, PhD, MScN, RN
Aalborg University Hospital & Aalborg University

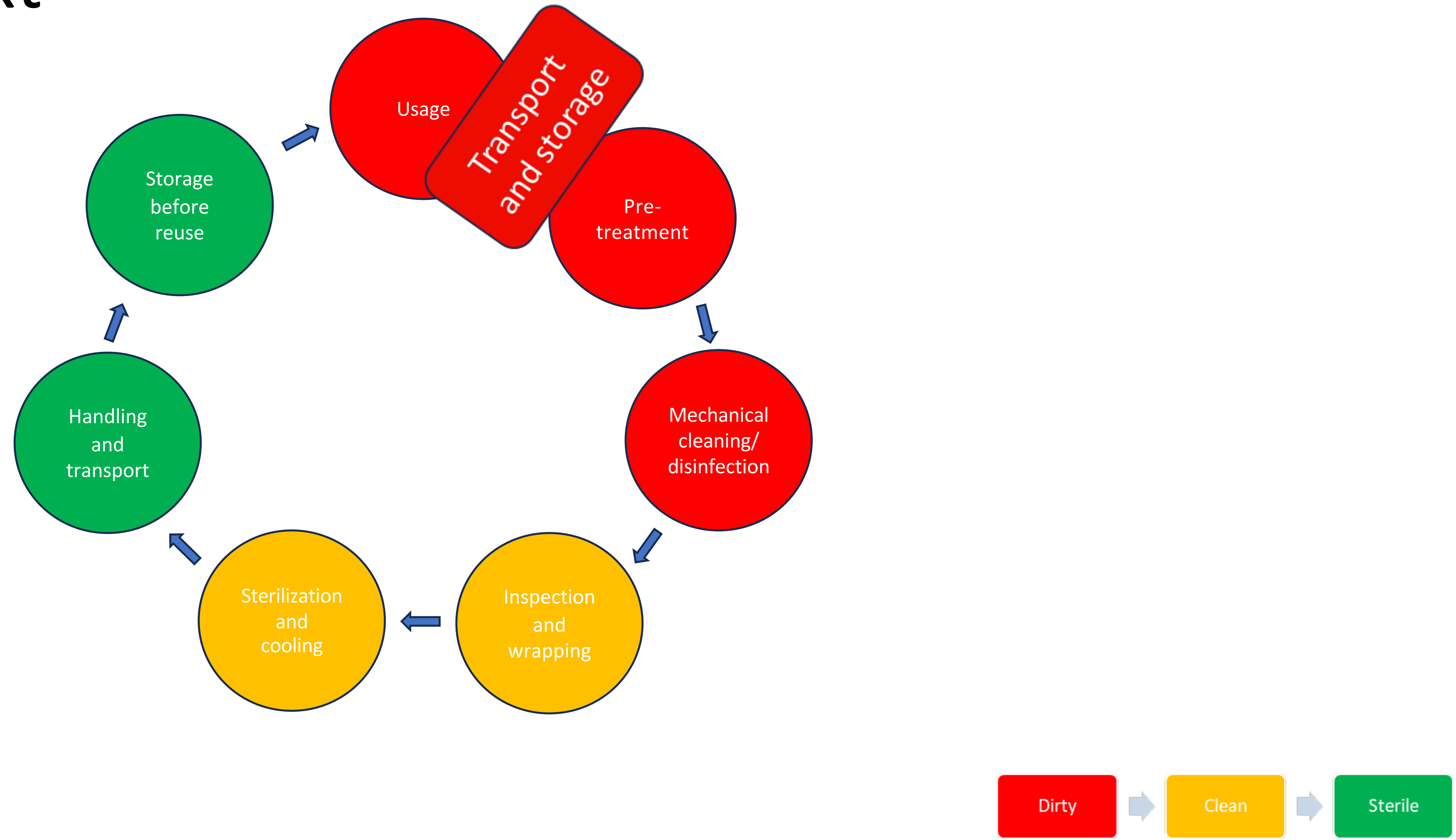
Partners in crime

Peter Rubak

Gerhard Kirmse

Silke Haibt-Winandi

The context


Usage
Transport and storage
Pre-treatment
Mechanical cleaning/ disinfection
Inspection and wrapping
Sterilization and cooling
Handling and transport
Storage before reuse
Dirty
Clean
Sterile

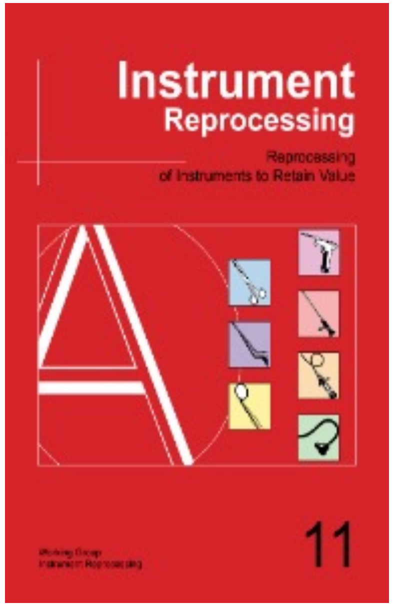
Introduction

International infection control guidelines recommend

- Reprocessing should commence immediately after use
- Different recommendations for environment
  - Europe: mostly dry to minimize risk of corrosion
  - UK and America: mostly moist to ensure efficient cleaning outcomes

However

- Recommendations are based on best practice and expert knowledge
- Research in a real-life clinical setting is warranted




Journal of Hospital Infection 122 (2022) 64–71

Available online at www.sciencedirect.com

Journal of Hospital Infection

journal homepage: www.elsevier.com/locate/jhin

ELSEVIER

Healthcare Infection Society

Can a humid storage environment of surgical instruments before reprocessing increase patient safety and durability of instruments?

P. Rubak[a], J. Lorenzen[b], K. Ripadal[c], A-E. Christensen[d], D. Aaen[e], H.L. Nielsen[e,f], K. Bundgaard[f,g,*]

Aim

Aim of the study

To compare moist and dry transportation of surgical instruments in a real-life clinical setting

- Protein residues (cleanliness)
- Corrosion (surface changes)

Methods

Data collection

- Aarhus University Hospital
- Basic instrument sets (54 and 39 surgical instruments)
- Transportation
    - Dry: Abdominal Surgery Department
    - Moist: Orthopedic Spine Surgery Department

Defining Moist transportation/storage

- OR-Gauze (16 g, 30x45 cm) soaked with 300 ml of sterile water
- Closed container

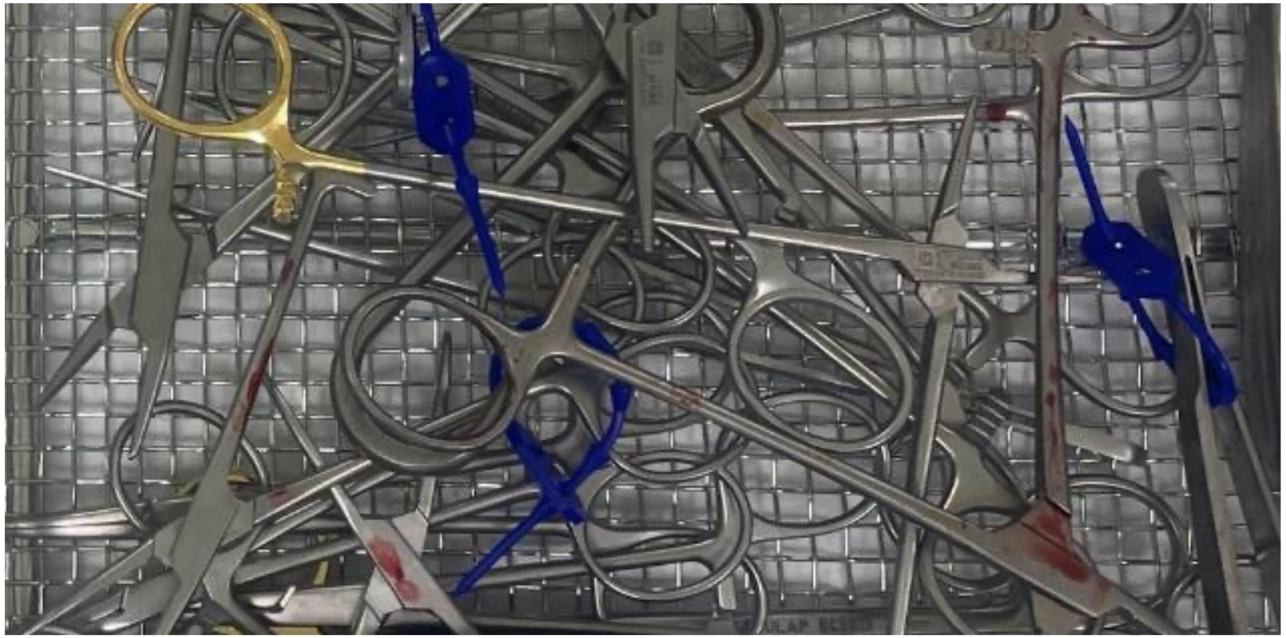
Methods

Protein residue test

- 5-10 contaminated inst
  each tray
- Washing process as is (s
  the disinfection phase)
- Elution process (include
- High-sensitive BCA prot
  (Bicinchoninic Acid)

al cleaning/disinfection	
ng	2 min
nzymatic Getinge cleaner 3 ml/l)	5 minutes at 55^0 C (total cleaning time 8 minutes)
	Soft water
	Soft water
lisinfection	Demineralized water A^0 3000
	15 minutes

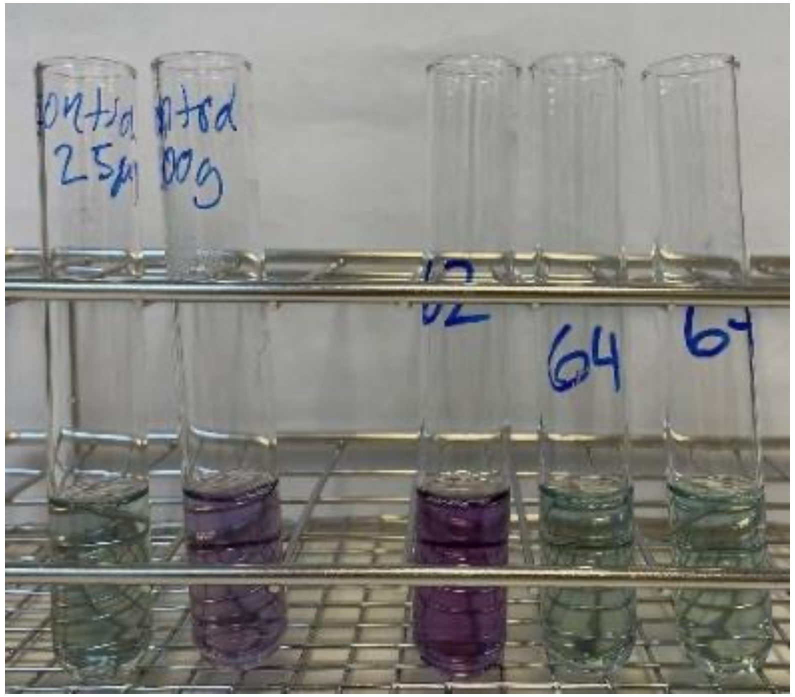

AESCULAP
BH211R
STAINLESS




Medisafe

Methods

Calibration curve BCA Protein Assay Kit



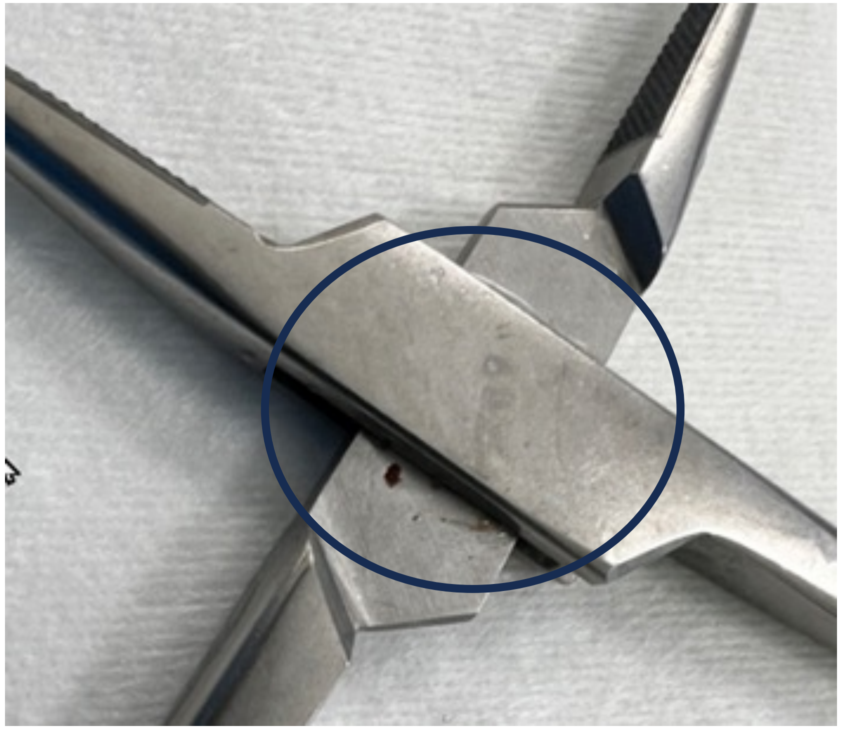
Methods

Surface changes

- Each instrument was visually inspected
  - Contact corrosion
  - Fretting
  - Pitting corrosion
  - Stains
  - Residue

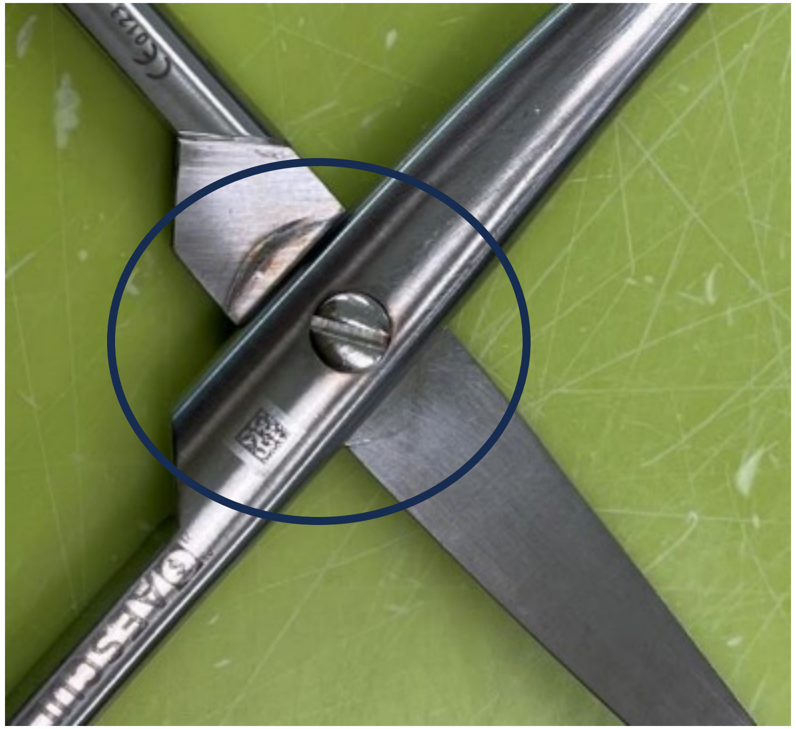
Score System	
0	No corrosion
1	Single small corrosion spot
2	Larger single corrosion spot, pitting
3	Several small corrosion spots
4	Several larger corrosions spots
5	Massive corrosion, multiple spots

Fretting corrosion



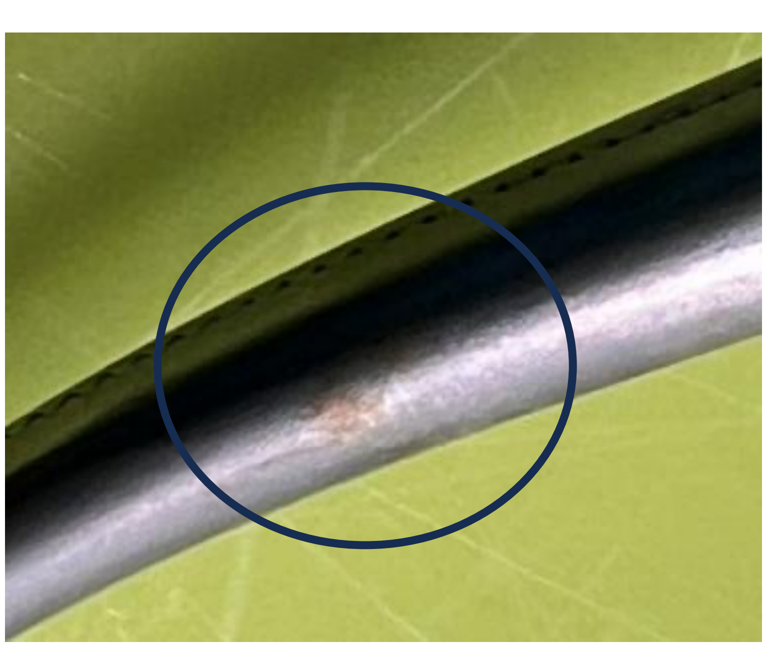
1 point

2 point

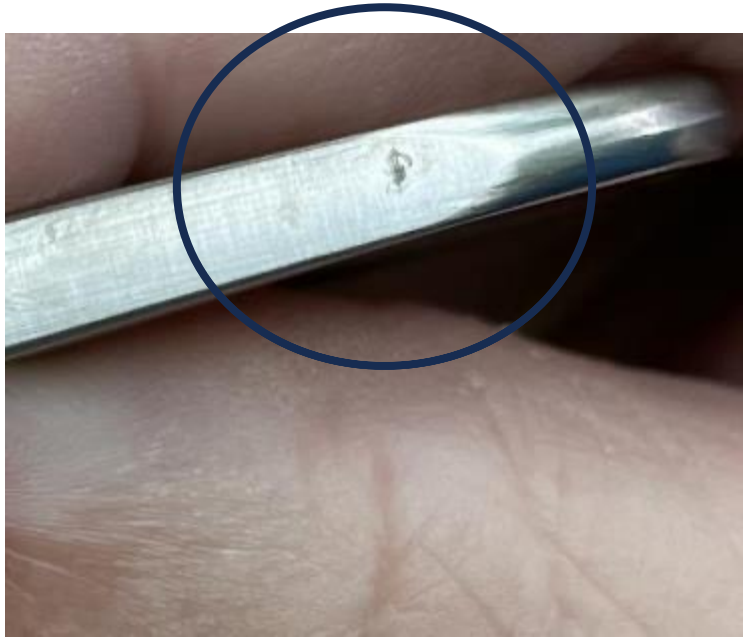


3 point

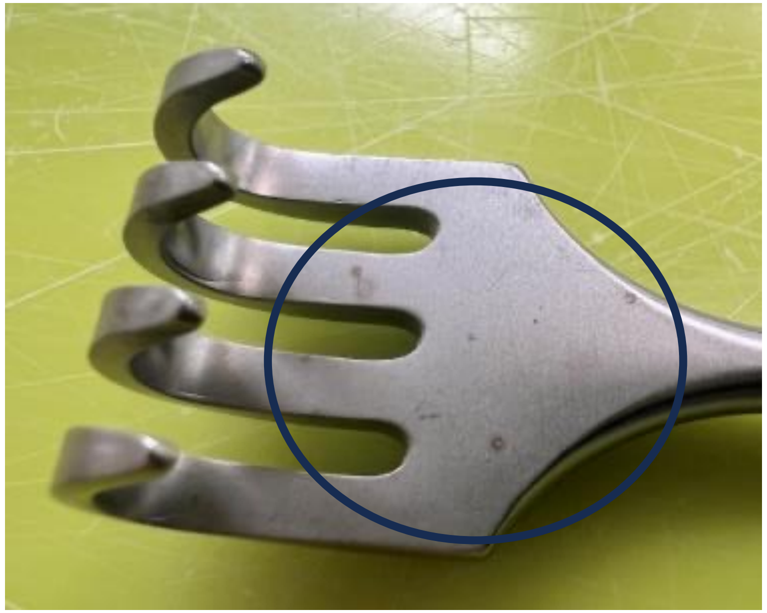
Contact corrosion



1 point

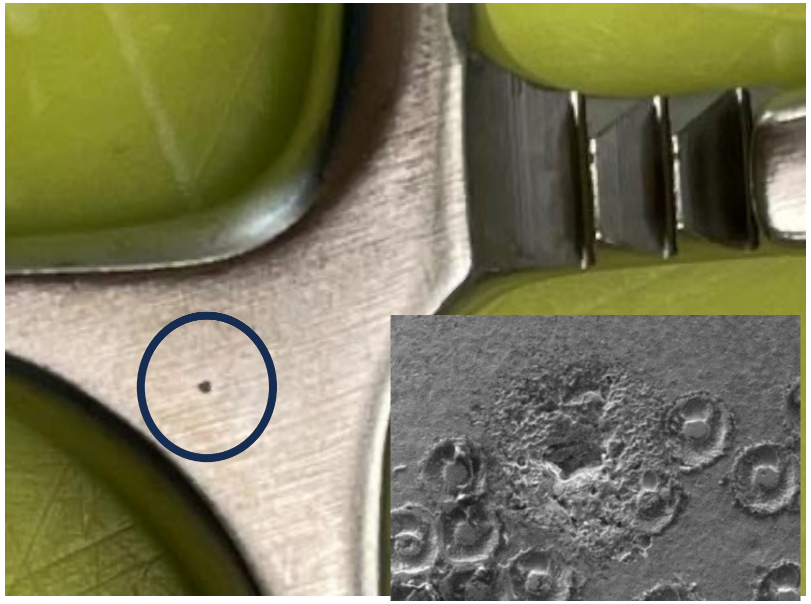


2 point



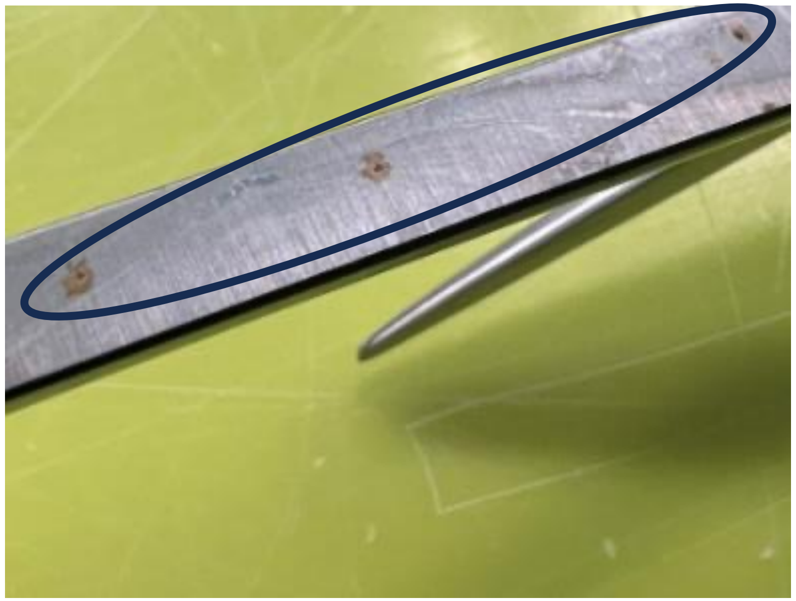
3 point

Pitting corrosion



1 point

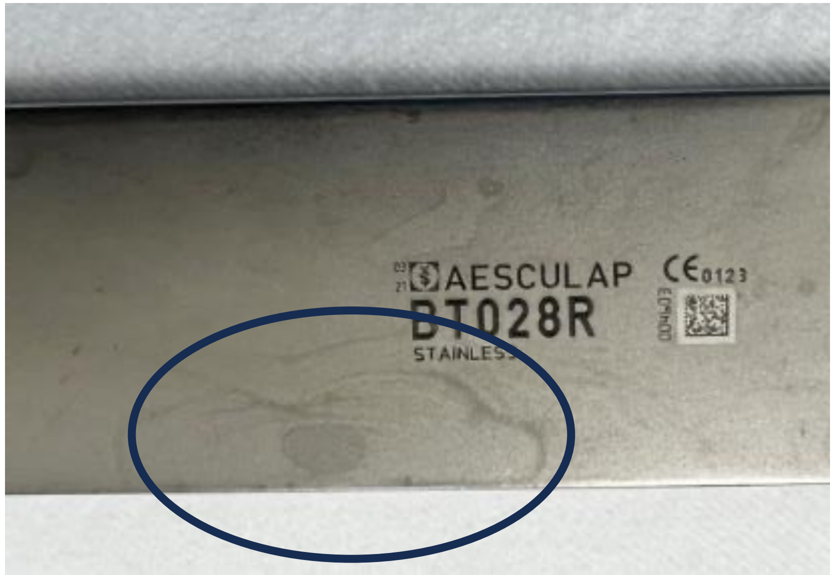
2 point

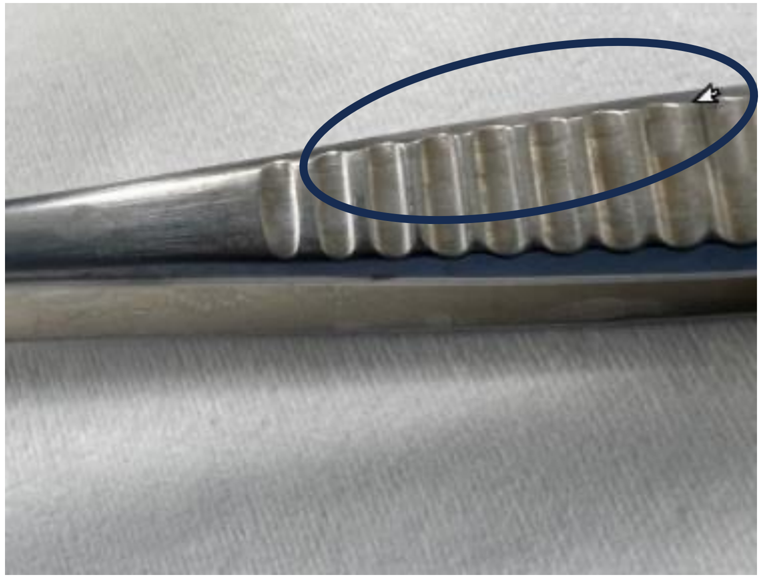


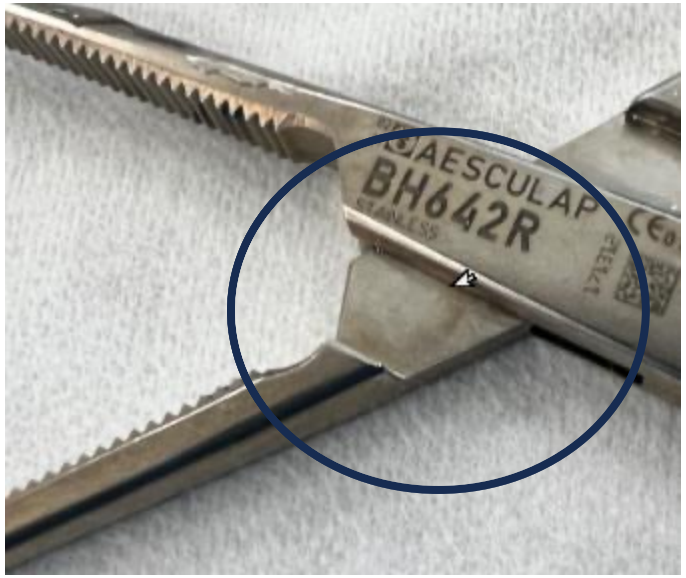
3 point

Residue

Staining







General data – Protein residue

Reprocessing Cycles

	MTK, Dry		EOP, Moist	
	Total	Tested	Total	Tested
Trays	24	12	10	8
Cycle, Mean	76	75	67	66
Cycle, Min	58	58	55	55
Cycle, Max	99	99	70	70

Waiting time before reprocessing

	Number of trays	
	Dry	Moist
2-4 hours	0	1
4-8 hours	1	1
8-12 hours	1	1
12-24 hours	8	6

General data - Corrosion

Reprocessing Cycles

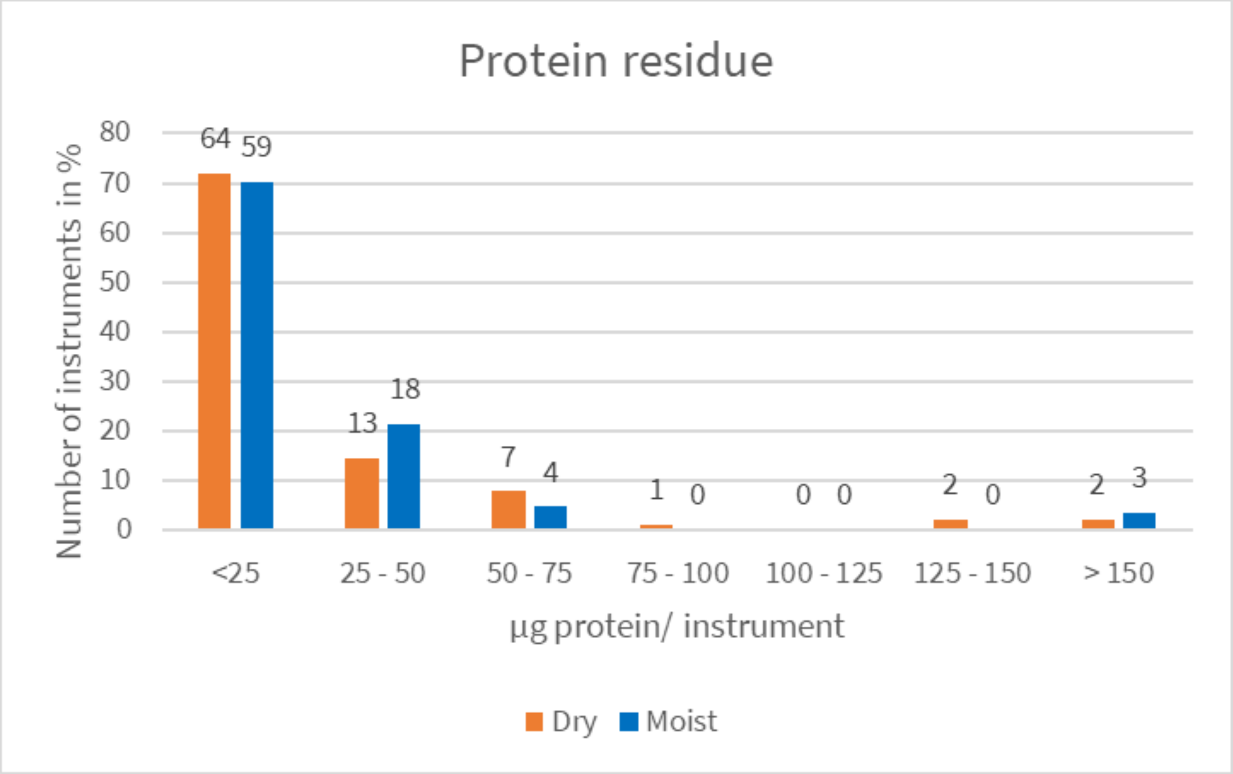
	MTK, Dry		EOP, Moist	
	Total	Tested	Total	Tested
Trays	24	10	10	9
Cycle, Mean	76	75	67	66
Cycle, Min	58	58	55	55
Cycle, Max	99	99	70	70

Exchanged instruments

	Number	Trays
Dressing Forceps	2	2
Forceps (Clamp)	3	2
Needleholders	5	5
Retractors	4	3
Scissors	6	5
Tweezers	4	2
Total	24	

Results

Protein residue



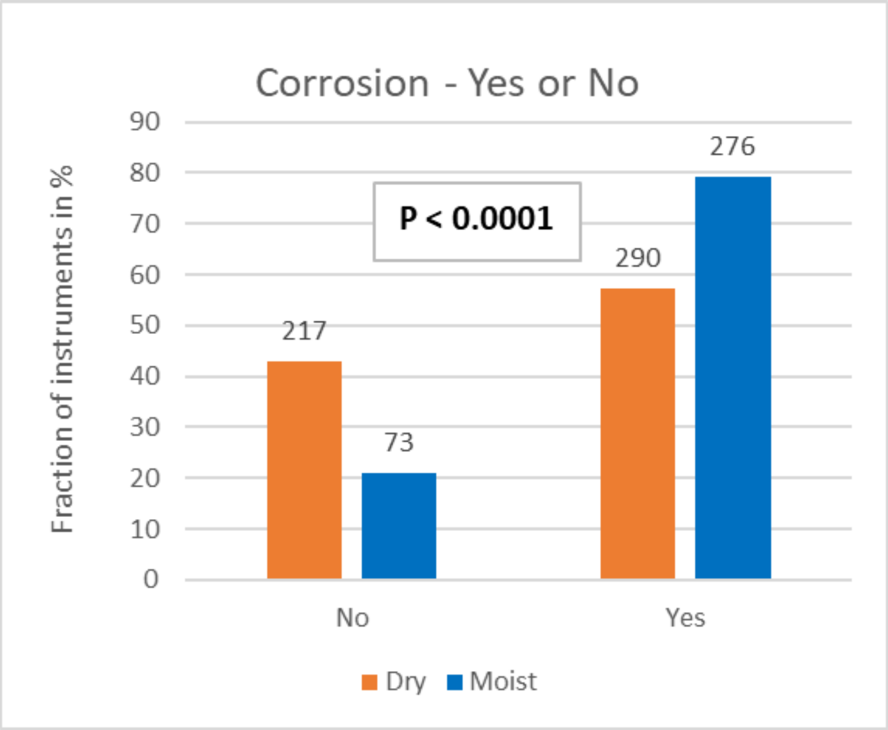
Numbers above the bars represents number of instruments

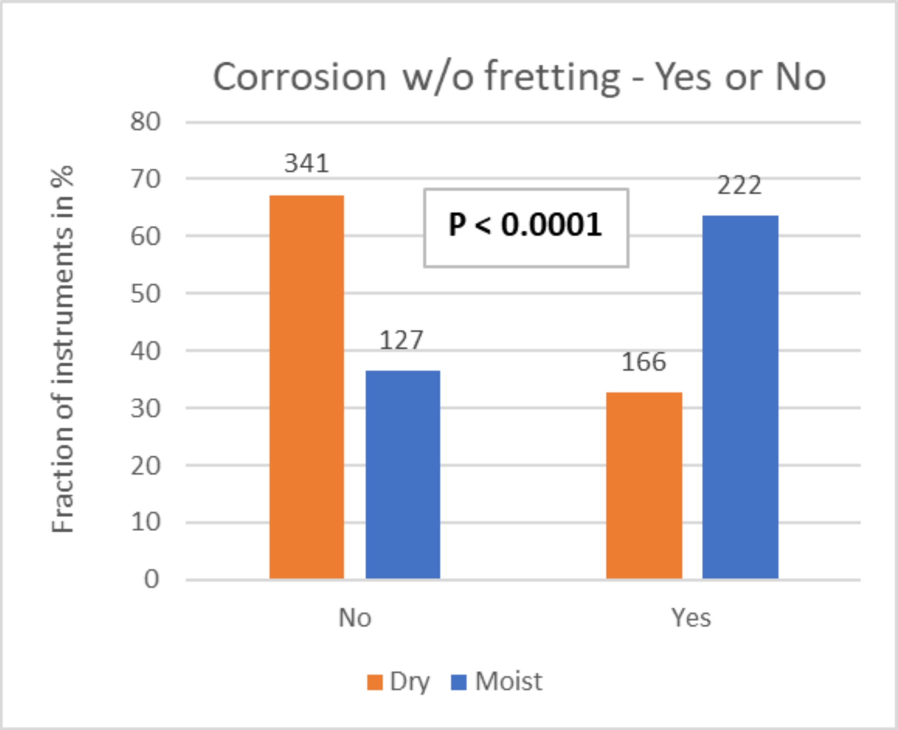
	Dry	Moist
n	89	84
Mean, [µg/Probe]	27,7	26,9
Median, [µg/Probe]	10,0	15,0
Min, [µg/Probe]	10	10
Max, [µg/Probe]	336	333
Sd	43,5	42,6
CV%	63,6	63,0
Nr. of trays	12	8

- Kruskal-Wallis test (raw data) p=0.56
- Chi^2-test (categorized data) p=0.55

Results

Surface changes

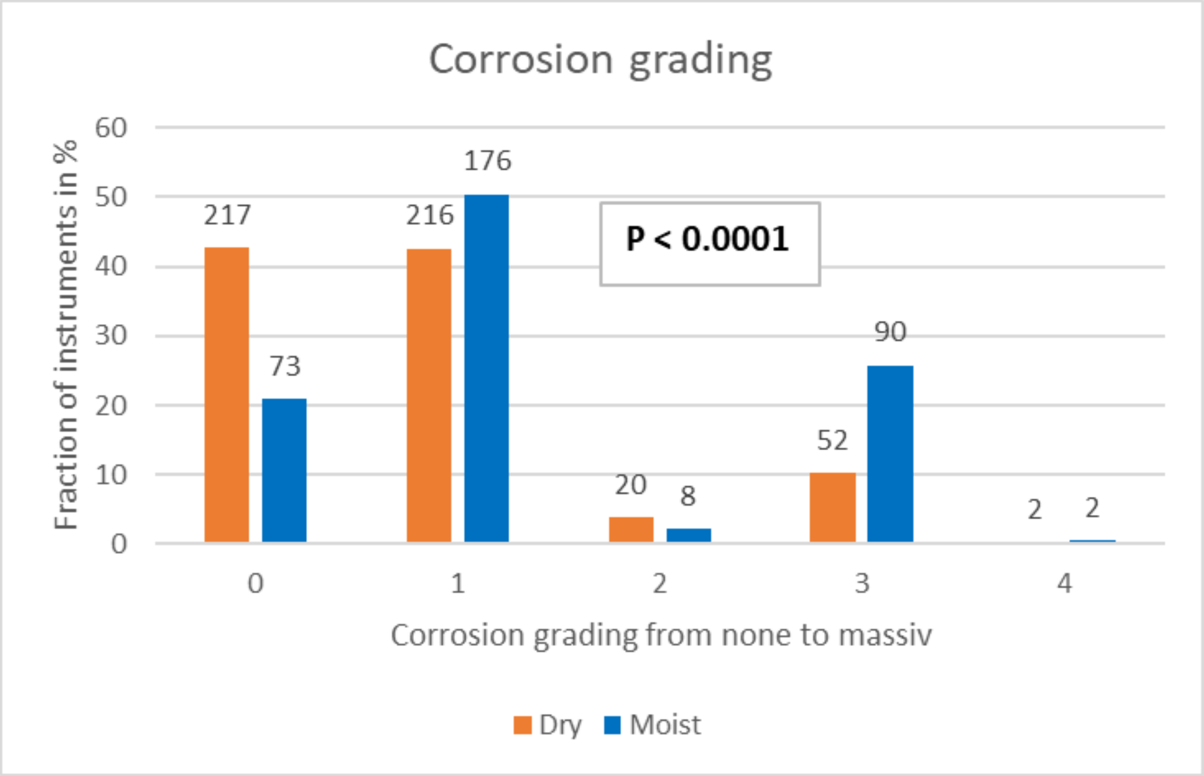




Numbers above the bars represents number of instuments

Results

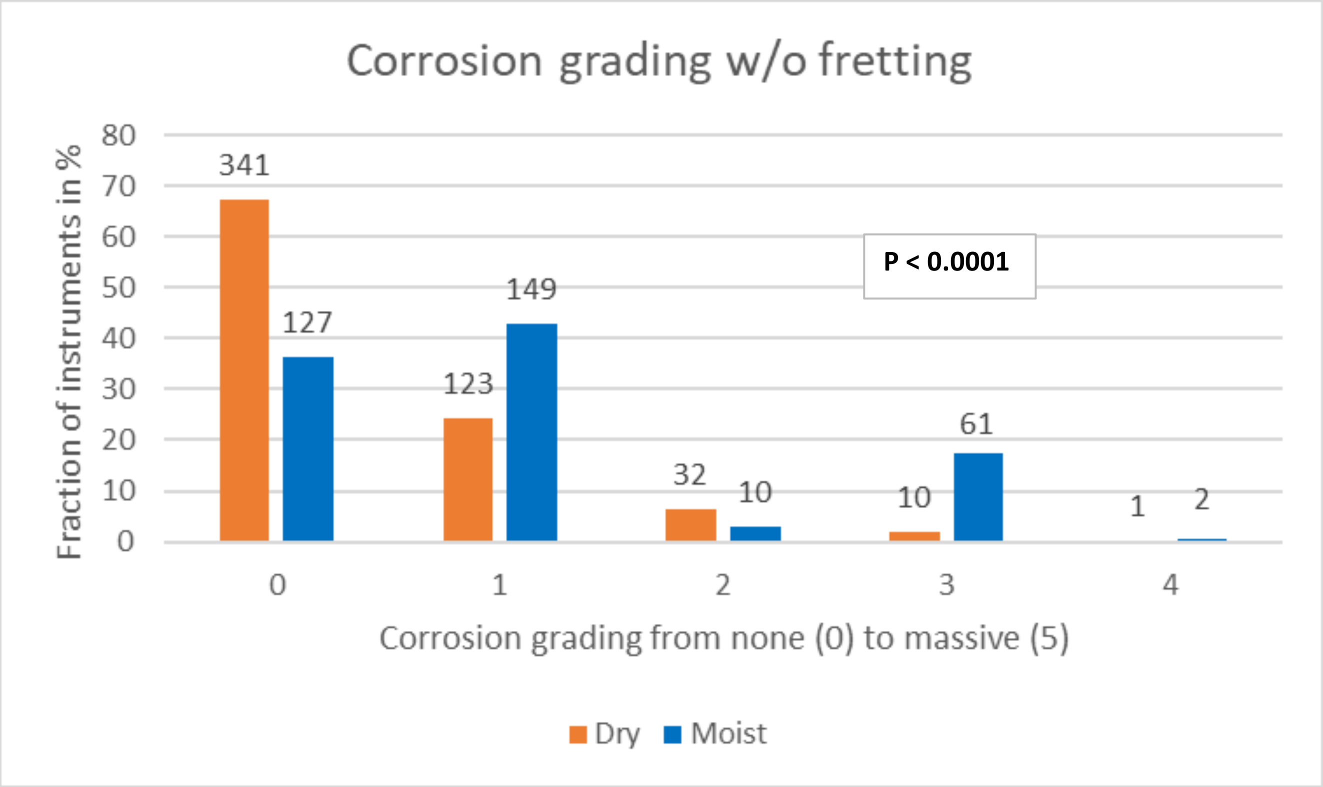
Corrosion grading including fretting



	Dry	Moist
n	507	349
Mean, Points	0.8	1.3
Median, Points	1.0	1.0
Nr. of trays	10	9

Results

Corrosion grading without fretting

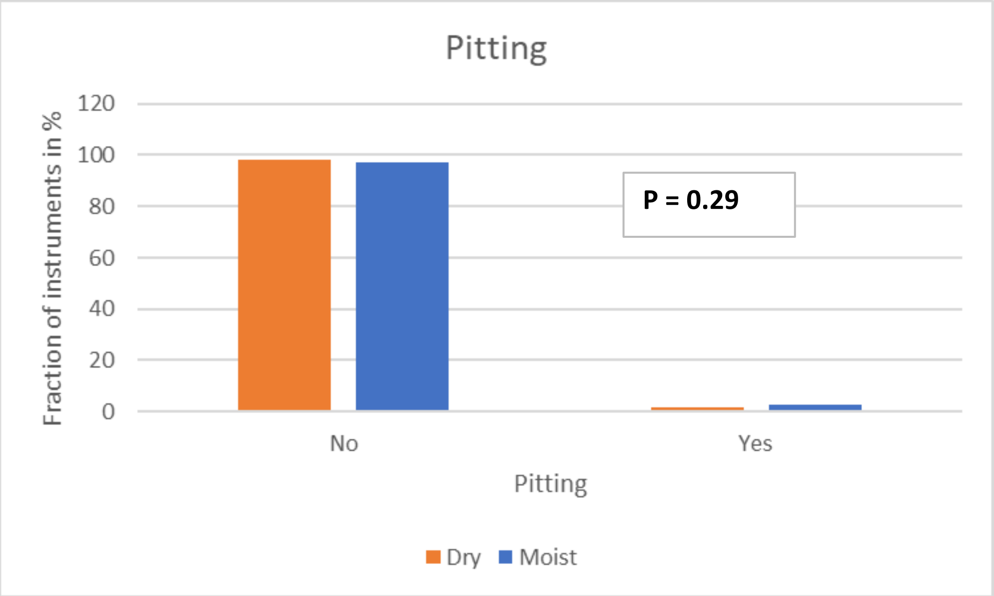


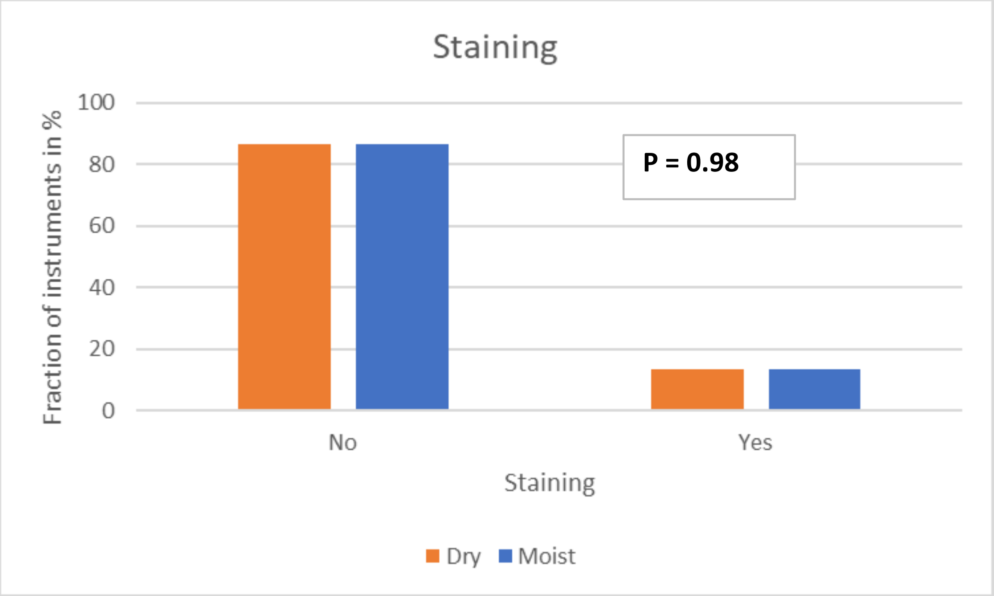
	Dry	Moist
n	507	349
Mean, Points	0.4	1.0
Median, Points	0.0	1.0
Nr. of trays	10	9

Results

Pitting and Stains

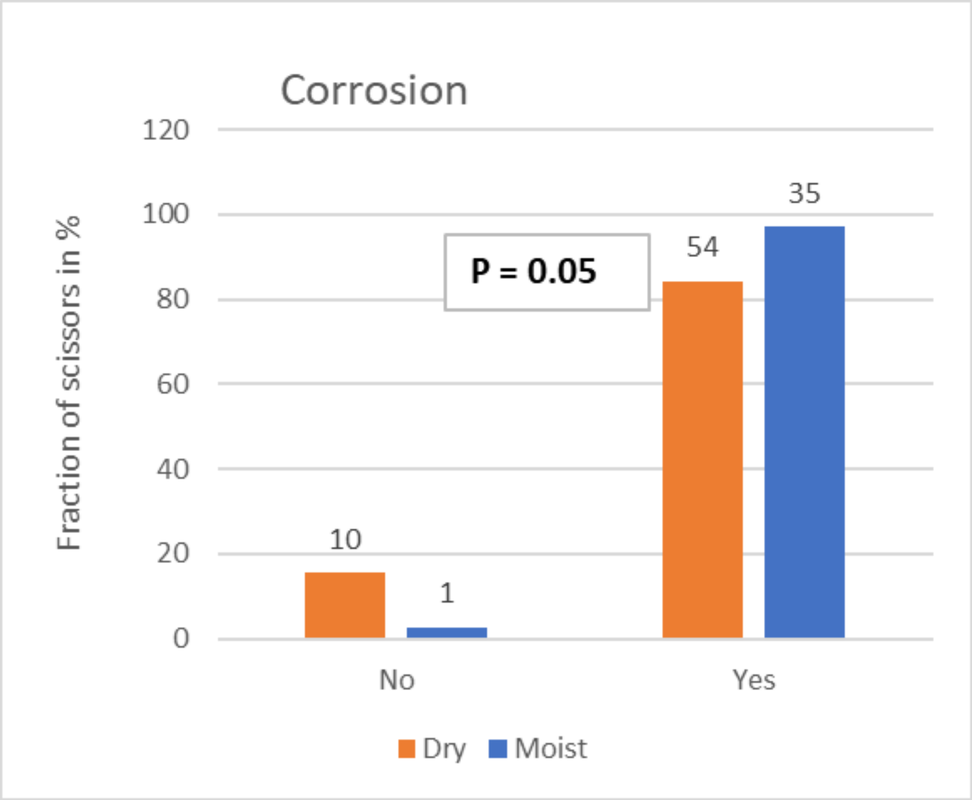
	Dry	Moist
n	507	349
Pitting	9	10
Stains	68	47
Nr. of trays	10	9

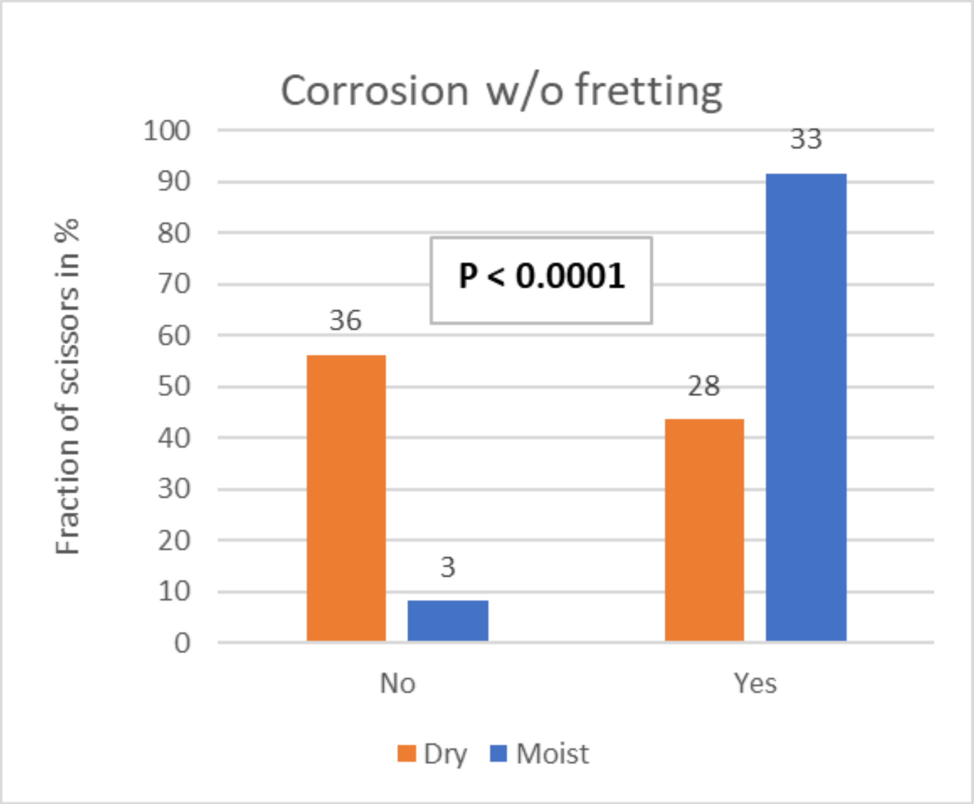




Results

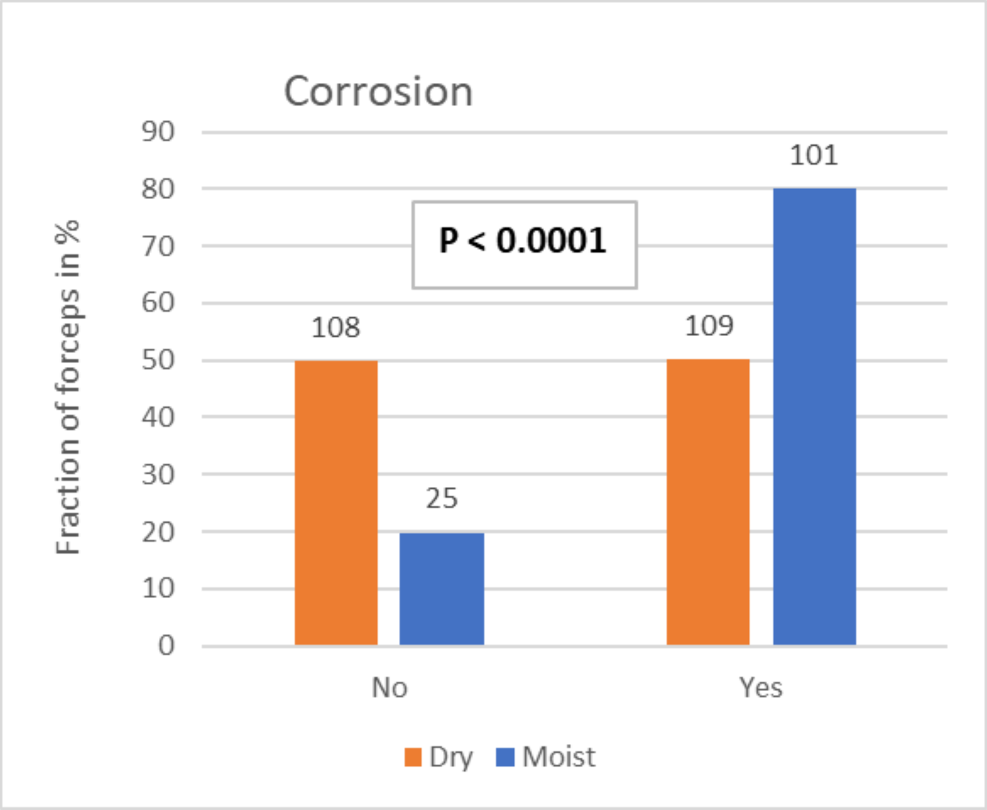
Corrosion with and without fretting on scissors

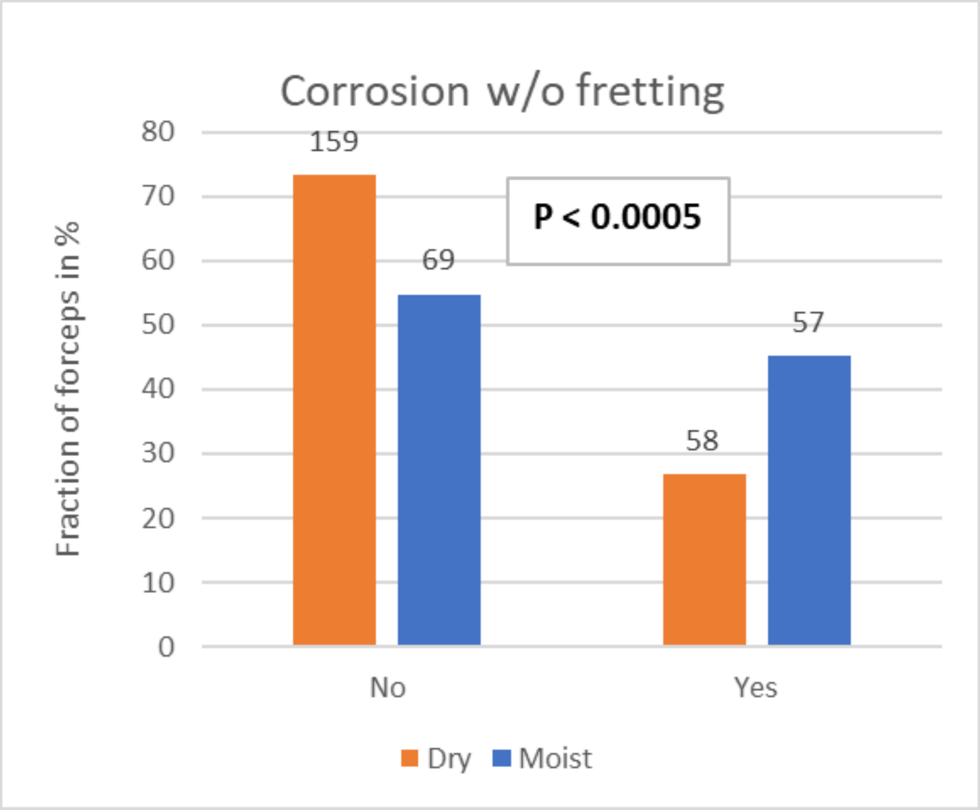




Results

Corrosion with and without fretting on forceps





Results

Comparison of instrument types

	n		Corrosion w. fretting, %		Corrosion w.o. fretting, %	
	Dry	Moist	Dry	Moist	Dry	Moist
Forceps	217	126	50	80	27	45
Needleholders	46	35	57	83	13	66
Scissors	64	36	84	97	44	92
Tweezers	56	72			45	85

Conclusion

Storage Environment and Instrument Cleanliness

- No correlation between storage environment and level of protein residue
- Insufficient data to establish a link between instrument type and level of protein residue

Storage Environment and Corrosion Formation

- Moist storage environments results in higher corrosion

Corrosion Across Instrument Types

- Consistency across instrument types independent of storage environment
- Scissors are the most corroded compared to needleholders, forceps, and tweezers

Reprocessing cycles and surface changes

- No correlation between number of reprocessing cycles and surface changes

Strengths and Limitations

- Real life setting
- Instruments used for surgery
- Number of examined instruments
- Reprocessing: Standard protocols for washing, disinfection and sterilization
- Handling of reprocessing: Trained personnel from the CSSD
- Protein residue analysis: Performed by professionals and use of a high sensitivity BCA method
- Corrosion analysis: Performed by professionals and use of a standardized scoring system

- Choice of method of creating a moist environment – spray instead of sterile water
- Choice of instruments – complex instruments instead of basic instruments

Thank you!