APPENDIX I

LIST OF MATERIALS AND INSTRUMENTS/EQUIPMENT

List of materials used in the study

Materials	Manufacturer
Chloramine T	Laboratory supplies, C.O.O. GERMANY
X-ray films	Eastman Kodak Co., Rochester, New York, USA
Impression compound	Kemdent, Associated. Dental Products, Swindon, UK
Clorox	Clorox™, Sdn. Bhd., Malaysia
EDTA 18%	Ultradent Products Inc., South Jordan, UT, USA
Ultradent® 5 ml syringe	Ultradent Products Inc., South Jordan, UT, USA
Endo-Eze® Irrigator Tips	Ultradent Products Inc., South Jordan, UT, USA
Mtwo rotary instrument	VDW, München, Germany
Filecare	VDW, München, Germany
K-files (colorinox)	Dentsply Maillefer, Ballaigues, Switzerland
Absorbent points	VDW, München, Germany
Gutta-percha points	VDW, München, Germany
AH Plus® sealer	Dentsply DeTrey, Konstanz, Germany
EndoREZ points	Ultradent Products Inc., South Jordan, UT, USA
EndoREZ sealer	Ultradent Products Inc., South Jordan, UT, USA
NaviTip	Ultradent Products Inc., South Jordan, UT, USA
Machtou's plugger, size 4	VDW, München, Germany
Finger spreader, size 25 and 30	VDW, München, Germany
IRM	Dentsply Caulk, Milford, USA
Clear cold curing epoxy resin (Mirapox A, Mirapox B)	Miracon, kuala lumpur, Malaysia
Plastic cuvette	Dispolab-Kartell II, Milano, Italy

List of instrument and equipment used in the study

Instrument and equipment	Manufacturer
Ultrasonic scaler	Densply® Cavitron® Bobcat® Pro, USA
X-ray unit	Progeny, Inc, USA
Digital caliper	Mitutoyo Corp/Digmatic, Japan
Locking tweezers	Nordent 2 stainless, Berlin, Germany
VDW.GOLD Micro-motor for root canal preparation	VDW, München, Germany
VALO$_{TM}$ Light curing unit	Ultradent Products Inc., South Jordan, UT, USA
BeeFill obturation unit	VDW, München, Germany
Incubator	Memmert GmbH, Schwabach, Germany
METASERY 2000 Grinding/Polishing Machine	BUEHLER UK LTD., COVENTRY, ENGLAND
Low speed saw	METKON®- MICRACUT® 125 Low Speed Precision Cutter, BuRSA/ TURKEY
Diamond rotary blade	PACE Technologies , Tucson, USA
Stereomicroscope	Olympus corporation TOKYO, JAPAN
Cell ^D software	(OLYMPUS Soft Imaging Solutions GmbH, 2008, Munster)
Field-emission gun scanning electron microscope (FESEM)	Low Vacuum Field Emission Gun, Quanta FEG 250 , FEI company, Hillsboro, USA

APPENDIX II

RAW DATA AND DATA ANALYSIS

Table A: Diameter at 1 mm (D1), 3 mm (D2) and 6 mm (D3) from the tip of twelve finger spreaders size 25 and 30 (VDW, München, Germany), accessory GP points size 25/0.02 (VDW, München, Germany) and accessory points size 25/0.02 (Ultradent Products Inc., South Jordan, UT, USA)

Sample No.	Finger spreader 25			Finger spreader 30			Gutta-percha 25			EndoREZ 25		
	D1	D2	D3	D1	D2	D3	D1	D2	D3	D1	D2	D3
1	0.26	0.3	0.35	0.29	0.34	0.4	0.28	0.33	0.39	0.29	0.33	0.41
2	0.25	0.29	0.35	0.29	0.33	0.38	0.27	0.31	0.38	0.24	0.28	0.36
3	0.24	0.28	0.34	0.28	0.32	0.4	0.29	0.33	0.39	0.20	0.25	0.33
4	0.25	0.29	0.35	0.29	0.33	0.39	0.29	0.33	0.4	0.20	0.27	0.36
5	0.26	0.30	0.36	0.27	0.32	0.38	0.27	0.31	0.38	0.24	0.29	0.35
6	0.24	0.29	0.33	0.31	0.33	0.41	0.27	0.31	0.39	0.22	0.27	0.35
7	0.25	0.27	0.31	0.27	0.31	0.41	0.25	0.29	0.35	0.22	0.28	0.35
8	0.24	0.28	0.34	0.28	0.32	0.39	0.3	0.33	0.39	0.26	0.29	0.37
9	0.25	0.3	0.35	0.28	0.32	0.39	0.28	0.32	0.39	0.23	0.27	0.35
10	0.23	0.28	0.34	0.30	0.33	0.39	0.28	0.31	0.38	0.24	0.29	0.36
11	0.25	0.30	0.36	0.29	0.34	0.4	0.29	0.34	0.4	0.23	0.27	0.35
12	0.25	0.27	0.31	0.27	0.31	0.39	0.26	0.31	0.35	0.22	0.27	0.36
Mean	0.25	0.29	0.34	0.29	0.33	0.39	0.28	0.32	0.38	0.23	0.28	0.36

Table B: Extrusion of filling materials in GP and ER groups using different obturation techniques:

Specimens number	CLC/GP	CLC/ER	WLC/GP	WLC/ER	SC/GP	SC/ER
1	No	No	No	No	No	No
2	No	No	No	No	No	No
3	No	No	**Yes**	No	No	No
4	No	No	No	**Yes**	No	No
5	No	No	No	No	No	No
6	**Yes**	No	No	No	No	No
7	No	No	**Yes**	No	No	No
8	No	**Yes**	No	No	No	No
9	No	No	No	No	No	No
10	No	No	**Yes**	No	No	No
11	**Yes**	No	No	**Yes**	No	No
12	No	No	No	No	No	No
13	No	No	No	No	No	No
14	No	No	No	No	No	No
15	No	No	No	No	No	No
16	No	No	No	No	No	No

Table C: Percentage of the core filling material in CLC technique

Speci-mens No.	CLC							
	GP				ER			
	L1	L3	L6	L9	L1	L3	L6	L9
1	76	97	100	92	78	81	83	86
2	65	85	81	82	100	100	100	100
3	76.73	82	90.6	88	84	94	95	96
4	57	89	88	90	100	100	93	95
5	69	93	93	87	83	95	100	100
6	94	87	99	96	84.6	87.5	88	90
7	87	96	90	95	94	97	96	94
8	78	97	93	94	100	100	100	99
9	88	93	96	85	100	100	100	93
10	85	89	83	73	75	87	89	93
11	89	97	94	95	94	97	92	90
12	85	87	82	92	100	100	97	92
13	68	100	100	98	90.18	100	100	100
14	91	95	100	97	95	100	98	98
15	83	90	84	84	92	100	100	93
Mean	79.45	91.8	91.57	89.87	91.32	95.9	95.4	94.6

Table D: Percentage of the core filling material in WLC technique

Speci-mens No.	WLC							
	GP				ER			
	L1	L3	L6	L9	L1	L3	L6	L9
1	82	100	100	100	87	96	97	97
2	100	100	96	97	100	100	100	100
3	81	96	100	96	87.5	100	100	98
4	100	95	100	96	95	100	100	99
5	94	100	100	97	91	100	100	100
6	86.86	97	96	91	79	100	100	100
7	100	100	100	95	100	100	100	99
8	89	94	97	100	100	97	100	100
9	90	82	100	99	100	100	100	100
10	83	100	100	100	100	100	100	97
11	82	93	98	93	93.9	100	97	97
12	70	97	94	99	100	100	100	100
13	81	96	98.5	98	100	100	100	100
14	88	100	100	93	100	100	100	100
15	100	92	98	97	100	100	100	100
Mean	88.46	96.13	98.5	96.73	95.56	99.53	99.6	99.13

Table E: Percentage of the core filling material in SC technique

Speci-mens No.	SC							
	GP				ER			
	L1	L3	L6	L9	L1	L3	L6	L9
1	50	60	78	82	76	84	98	95
2	47	59	68	83	94	91	85	93
3	78	79	87	75	60	86.46	95	94
4	57	61.5	72	80	97	90	87	96
5	46	77	86	88.3	86	89	91	98
6	42	67	86	81	70.5	92	91	95
7	75	65	76.96	86	67	91	93	100
8	54	66.23	64	78	75	89	93	93
9	69	68	80	87	69	84	71	91
10	59	80	75	79	71	68	76	96
11	56.8	67	71	88	74	91	92	93
12	69	64	72	86	74.16	91	97	93
13	46	74	85	82	68	85	89	79
14	60	60	86	81	85	91	95	95
15	67	60	87	85	64	94	91	94
Mean	58.39	67.18	78.26	82.75	75.38	87.76	89.6	93.67

Table F: Percentage of the core filling area in GP and ER groups

Original measurement		First measurement	Second measurement
CLC/GP 3-1	76.73%	74.5%	75%
CLC/GP 4-3	89%	88%	90%
CLC/GP 5-3	93%	92%	93%
CLC/GP 6-6	99	97%	98%
CLC/GP 7-9	95%	93%	92%
CLC/GP 8-9	94%	95%	93%
CLC/ER 3-1	84%	85%	87%
CLC/ER 4-3	100%	100%	100%
CLC/ER 5-3	95%	95%	93%
CLC/ER 6-6	88%	84%	87%
CLC/ER 7-9	94%	93%	92%
CLC/ER 8-9	99%	97%	99%
WLC/GP 3-1	81%	84%	81%
WLC/GP 4-3	95%	97%	96%
WLC/GP 5-3	100%	100%	100%
WLC/GP 6-6	96%	94%	92%
WLC/GP 7-9	95%	94.5%	94%
WLC/GP 8-9	100%	100%	100%
WLC/ER 3-1	87.5%	88%	85%
WLC/ER 4-3	100%	100%	100%
WLC/ER 5-3	100%	100%	100%
WLC/ER 6-6	100%	100%	100%
WLC/ER 7-9	99%	95%	97%
WLC/ER 8-9	100%	100%	100%
SC/GP 3-1	78%	77%	79%
SC/GP 4-3	61.5%	64%	62%
SC/GP 5-3	77%	75%	79%
SC/GP 6-6	86%	84%	86%
SC/GP 7-9	86%	84%	85%
SC/GP 8-9	78%	76%	78%
SC/ER 3-1	60%	63%	61%
SC/ER 4-3	90%	88%	91%
SC/ER 5-3	89%	90%	89%
SC/ER 6-6	91%	94%	90%
SC/ER 7-9	100%	100%	100%
SC/ER 8-9	93%	93%	91%

Table G: Reliability test

	Intraclass correlation	95% Confidence interval	F test with True value 0			
		Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	.98	.965	.991	108.966	35.0	35	.000
Average Measures	.991	.982	.995	108.966	35.0	35	.000

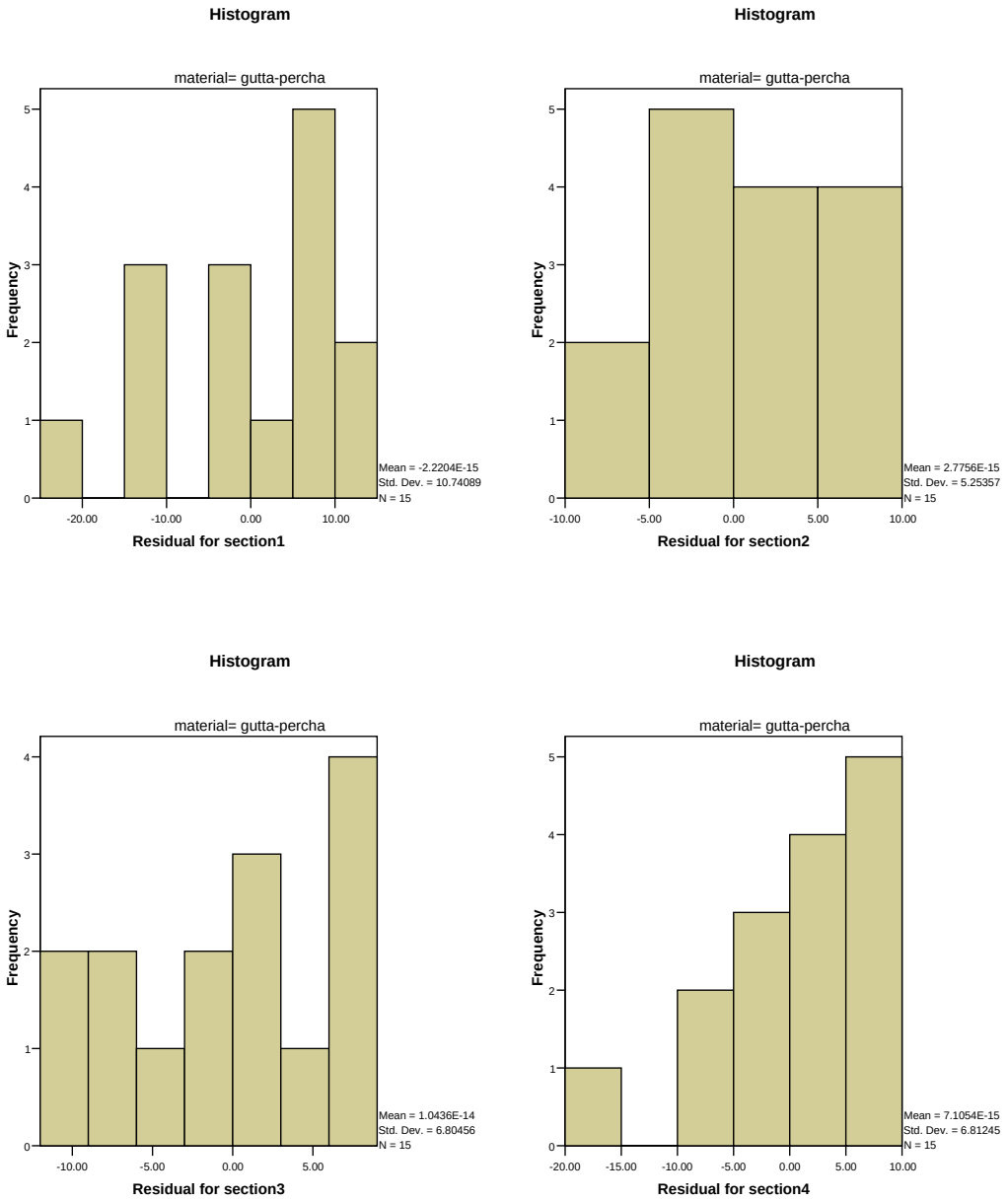


Figure 1: Distribution of the percentage of core filling material of CLC/GP at different levels (L1, L3, L6 and L9).

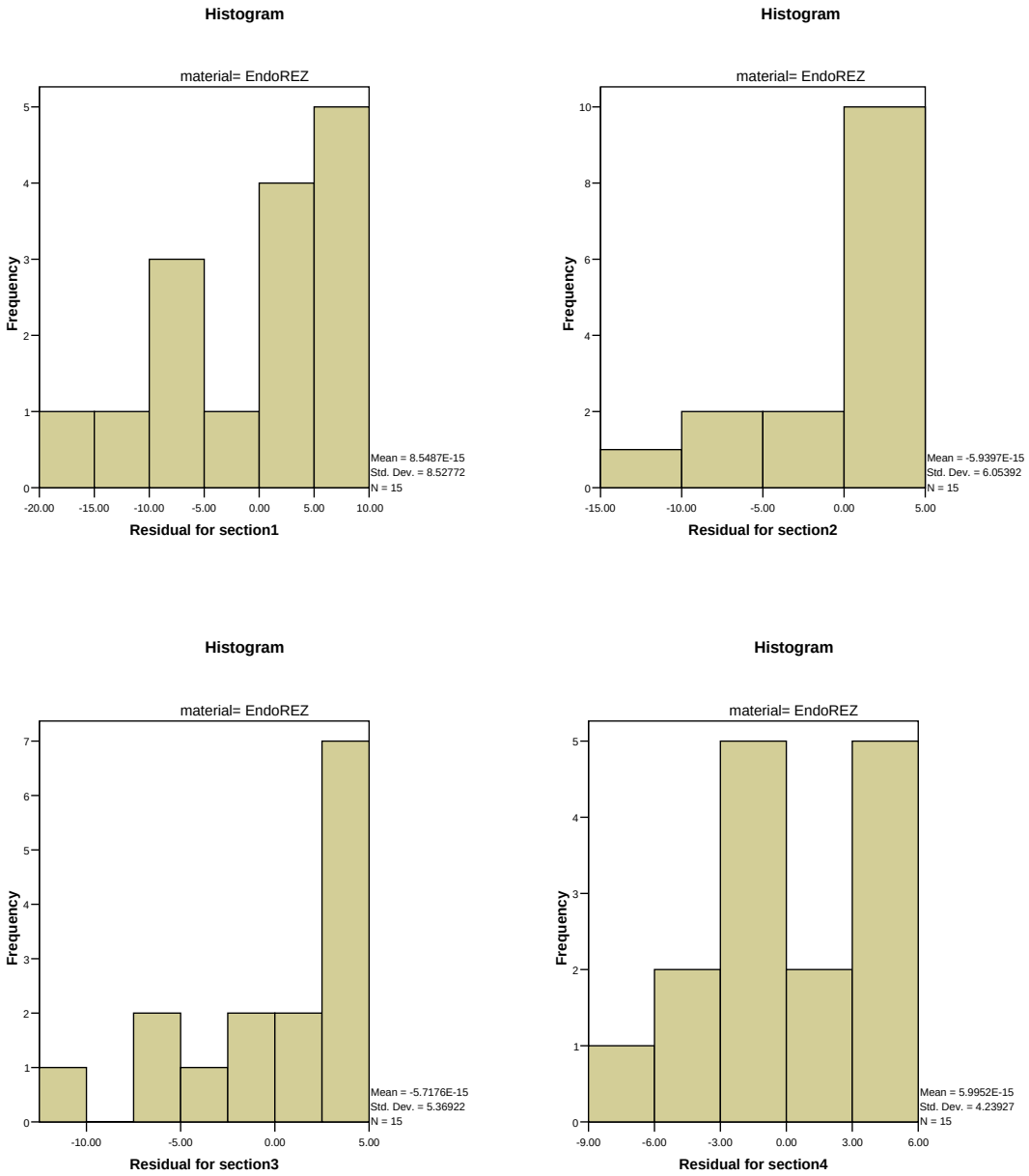


Figure 2: Distribution of the percentage of core filling material of CLC/ER at different levels (L1, L3, L6 and L9).

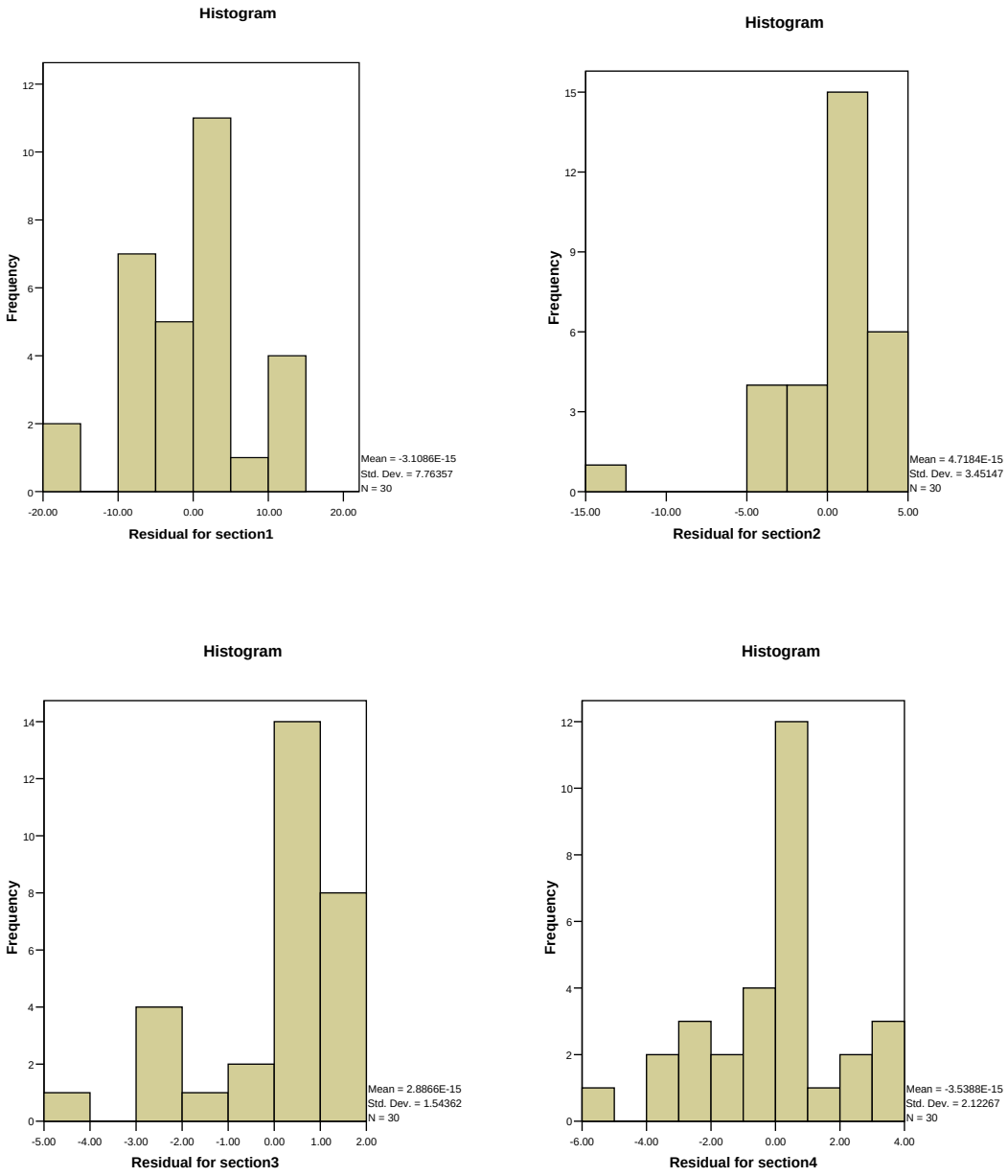


Figure 3: Distributions of the percentage of core filling materials (GP and ER) at different levels (L1, L3, L6 and L9) in WLC.

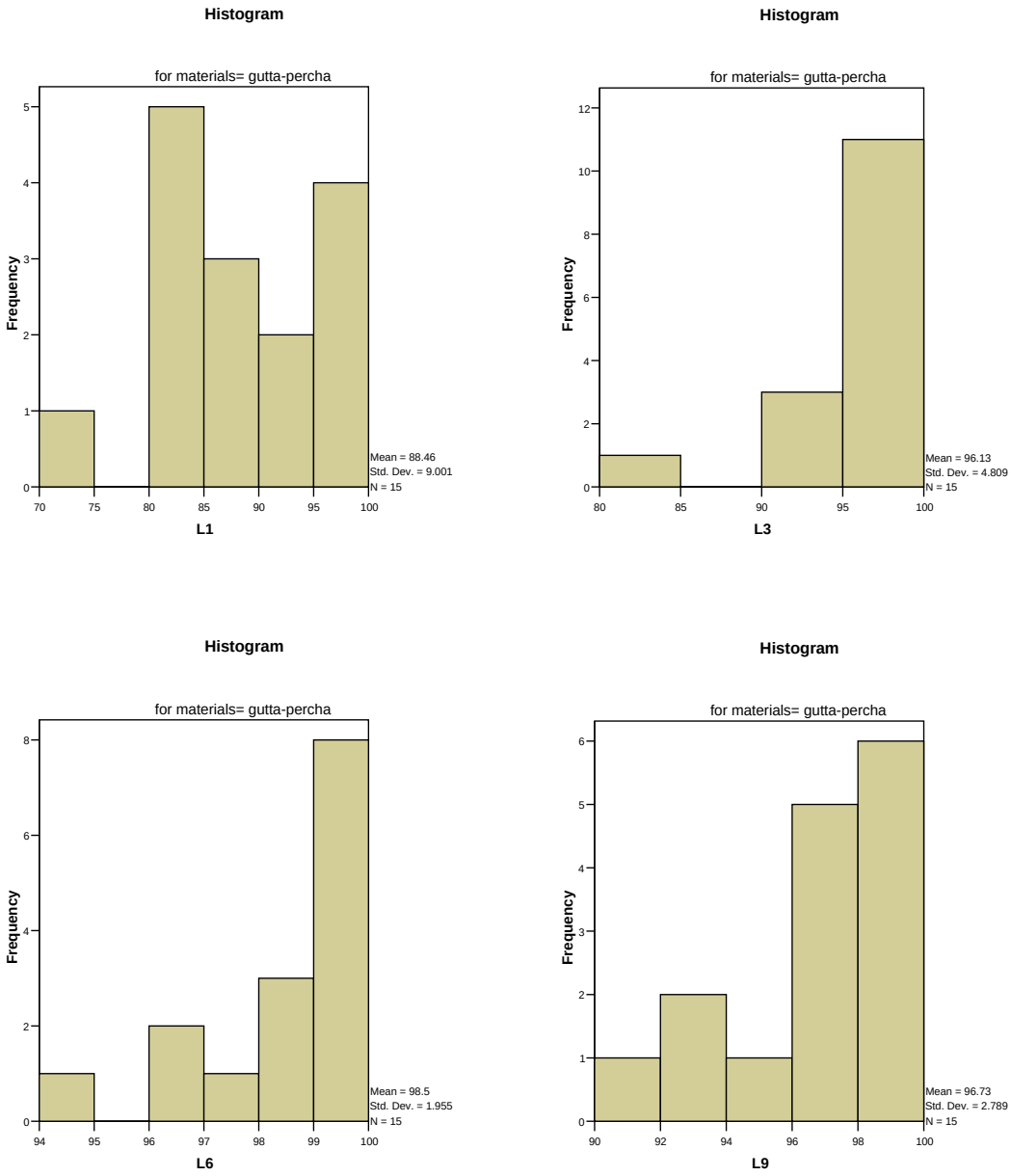


Figure 4: Distribution of the percentage of core filling material of WLC/GP at different levels (L1, L3, L6 and L9).

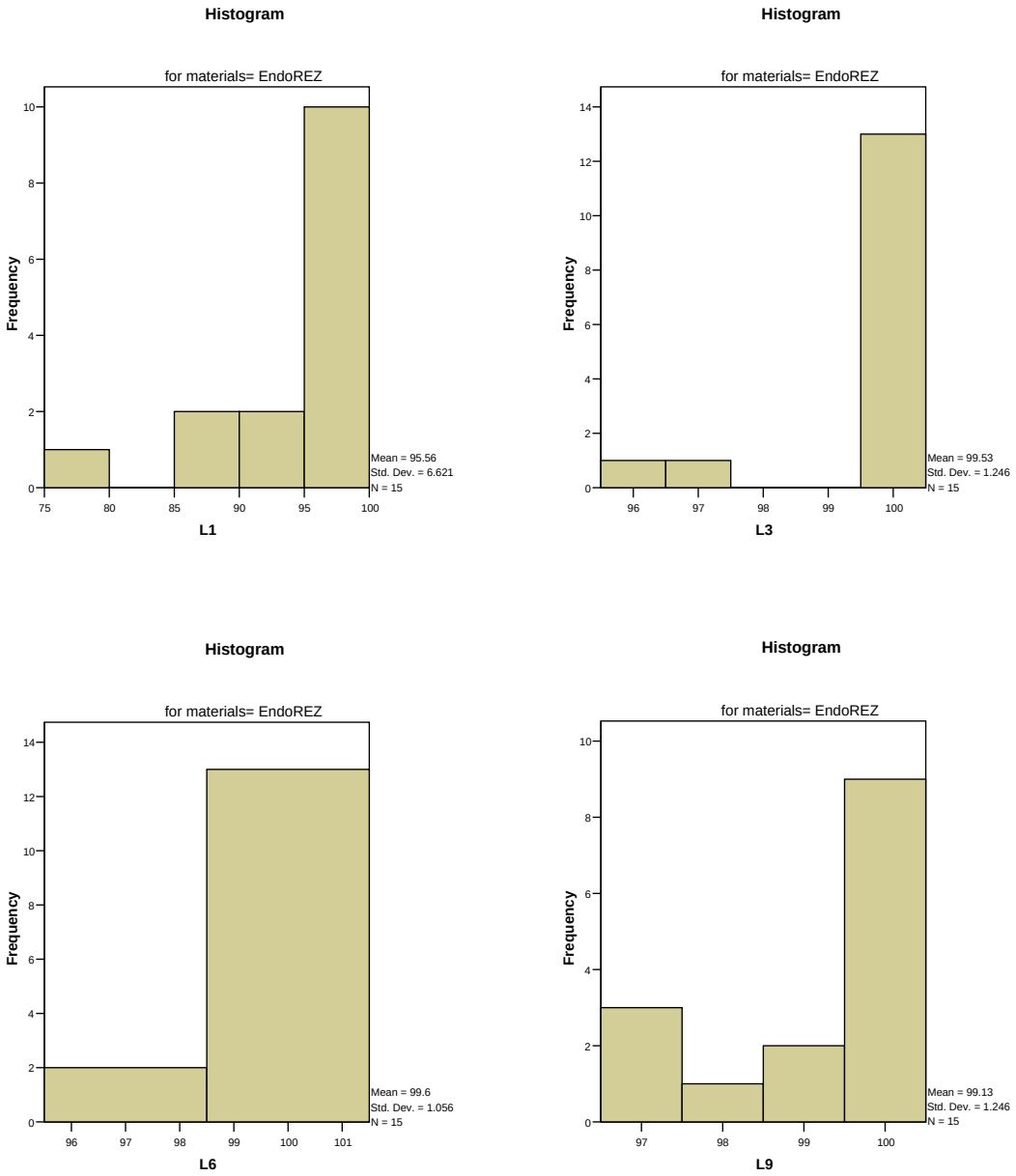


Figure 5: Distribution of the percentage of core filling material of WLC/ER at different levels (L1, L3, L6 and L9).

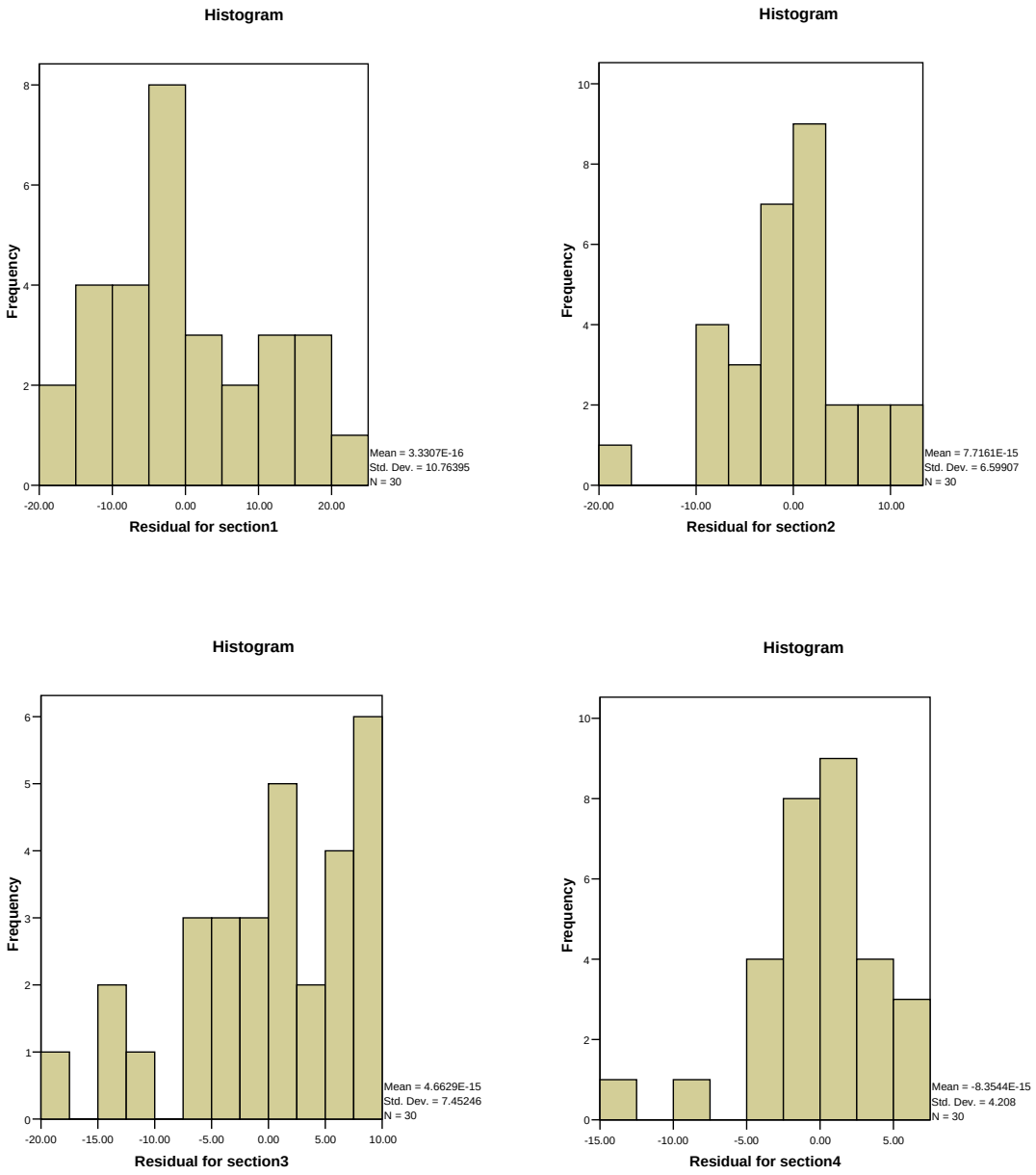


Figure 6: Distributions of the percentage of core filling materials (GP and ER) at different levels (L1, L3, L6 and L9) in SC.

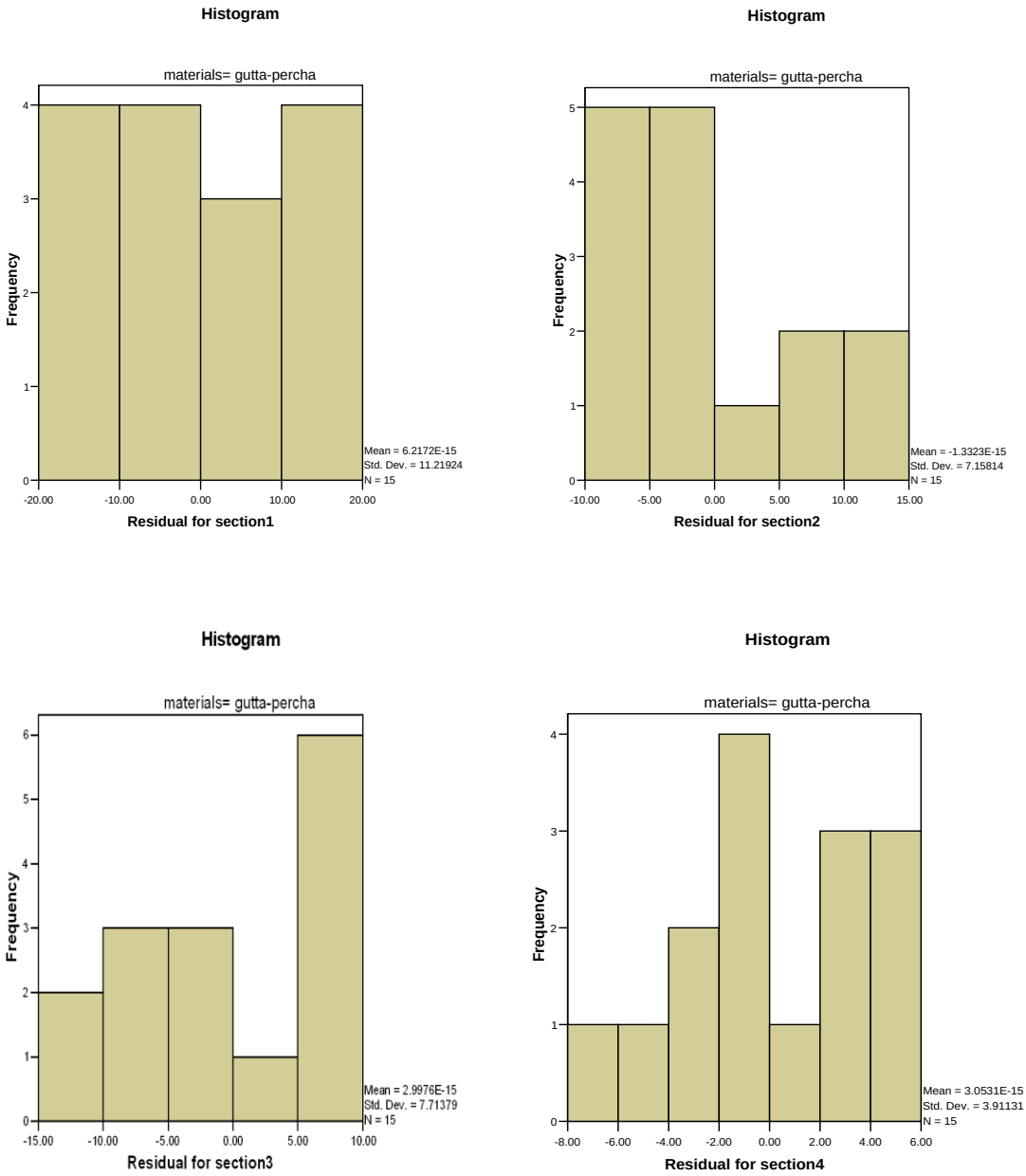


Figure 7: Distribution of the percentage of core filling material of SC/GP at different levels (L1, L3, L6 and L9).

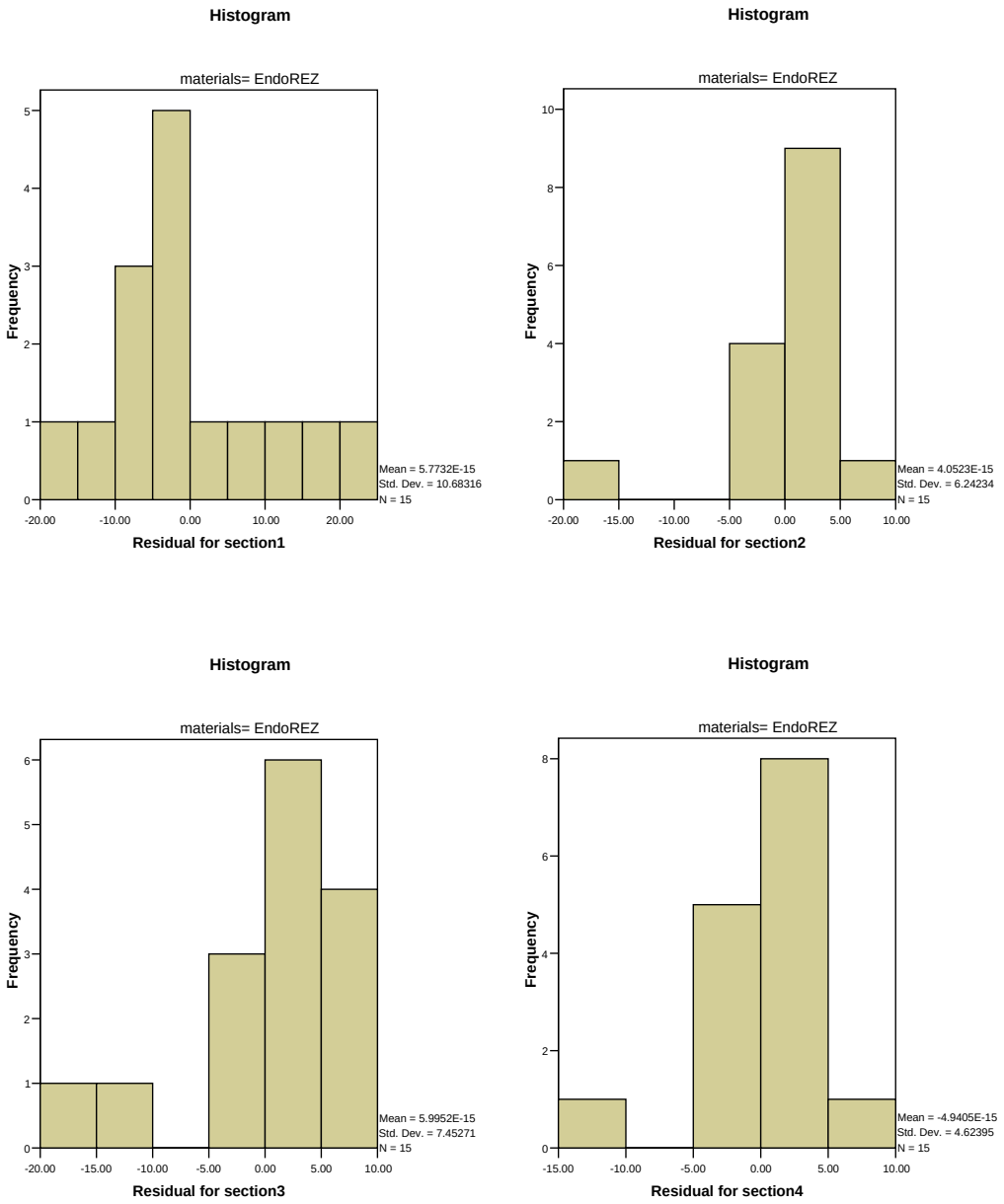


Figure 8: Distribution of the percentage of core filling material of SC/ER at different levels (L1, L3, L6 and L9).

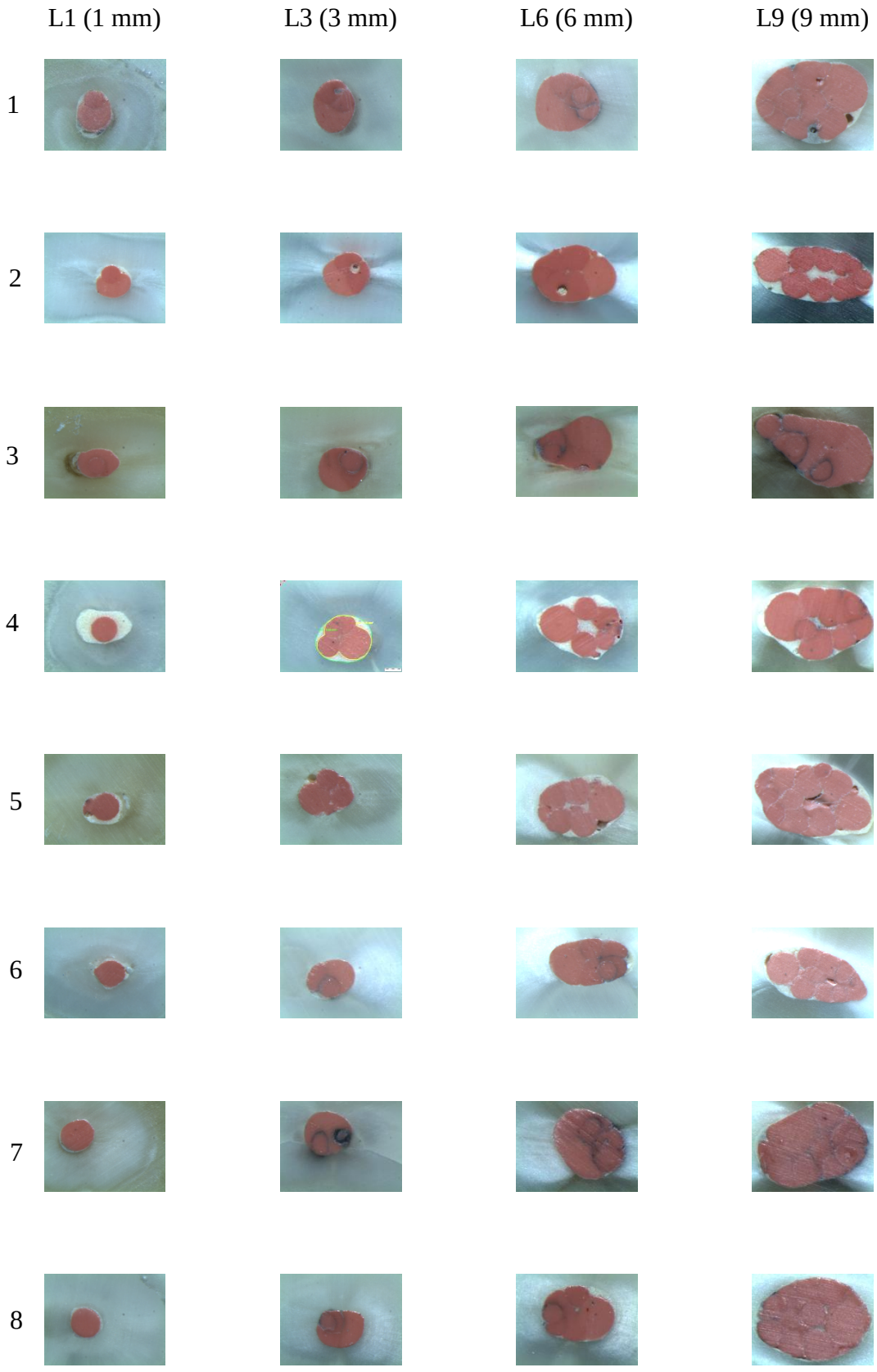


Figure 9: Stereomicroscopic images of L1, L3, L6 and L9 sections for CLC/GP (Sample 1-8)

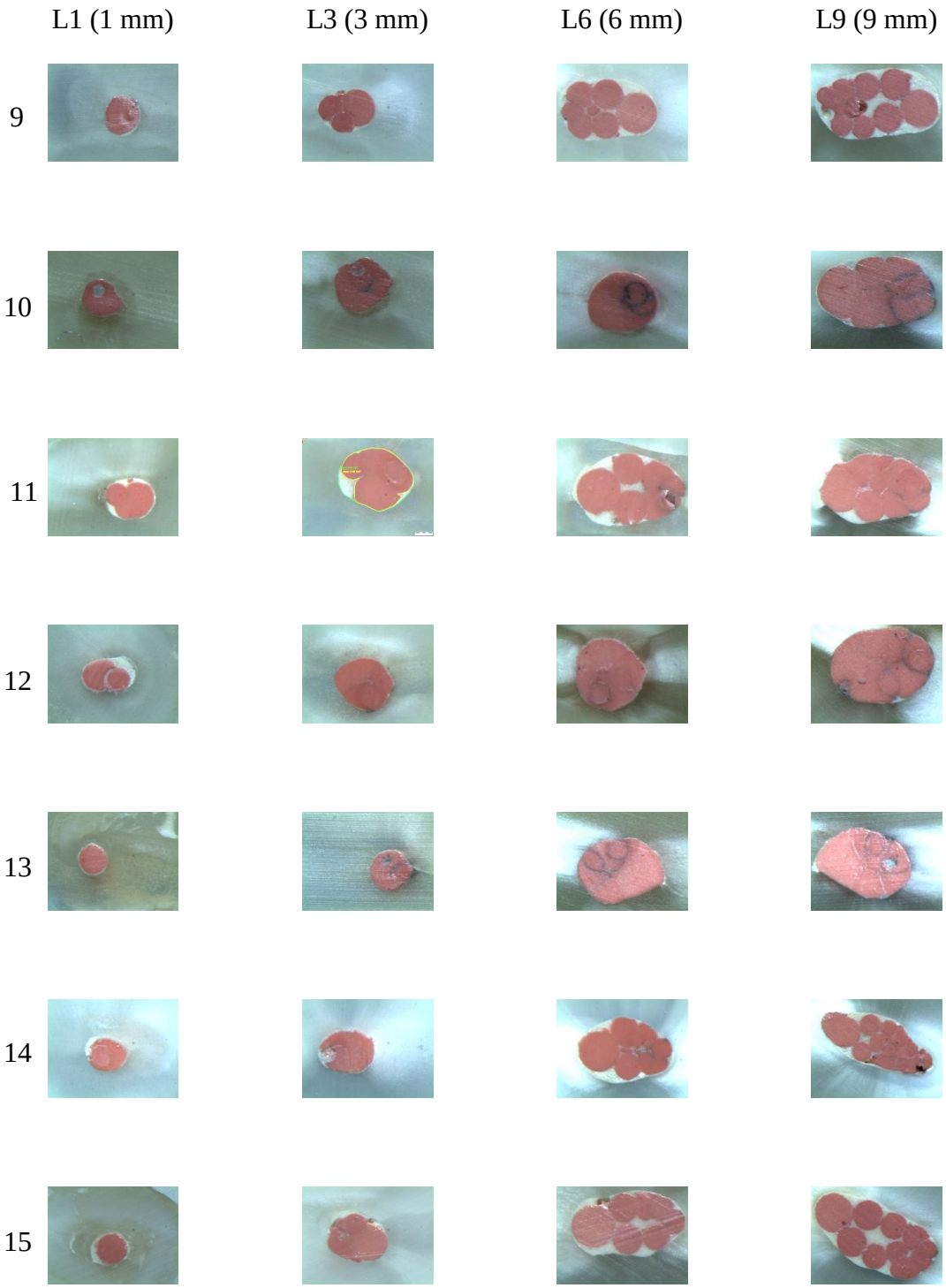


Figure 9: continued…..
(Sample 9-15)

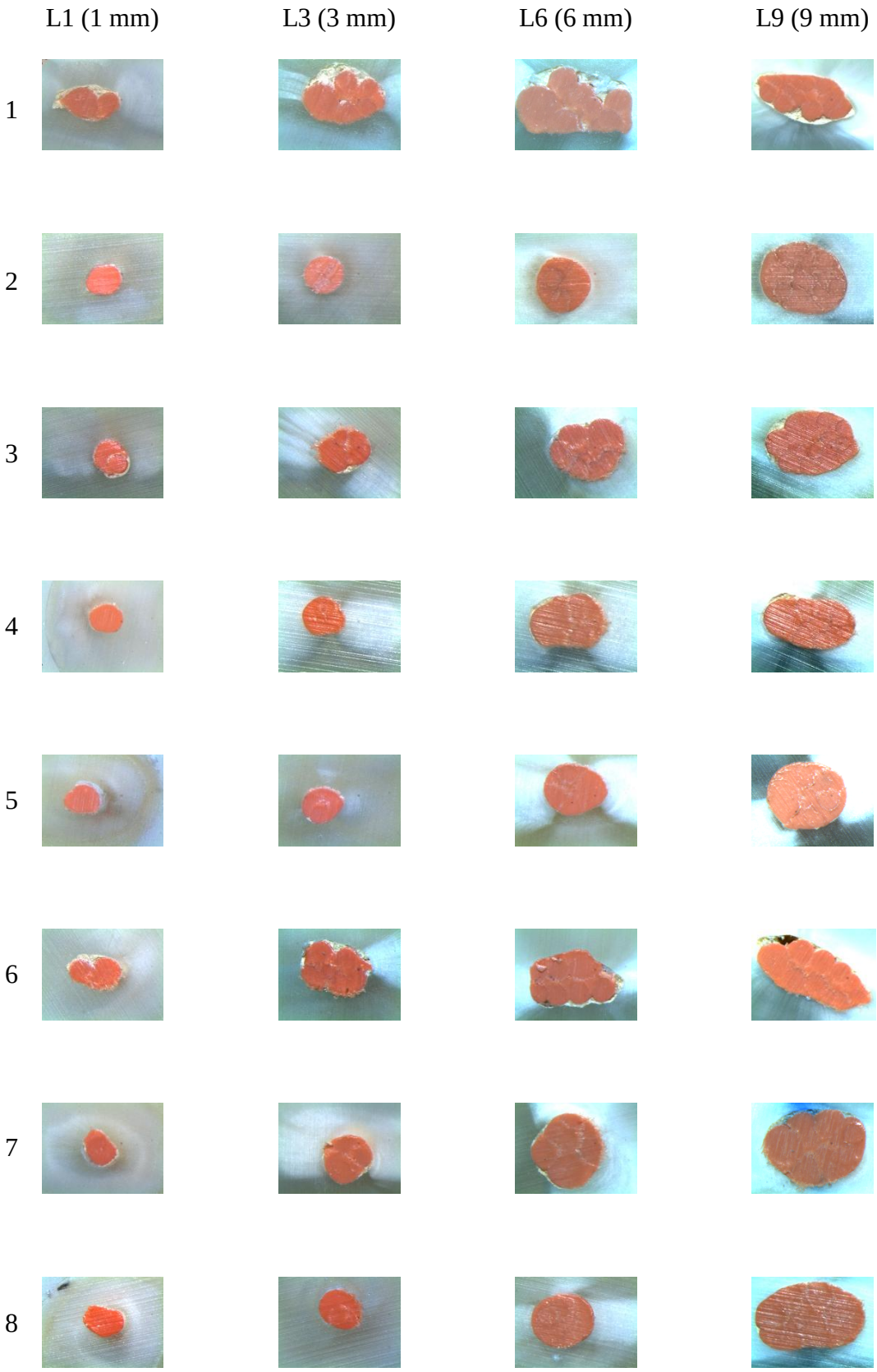


Figure 10: Stereomicroscopic images of L1, L3, L6 and L9 sections for CLC/ER (Sample 1-8)

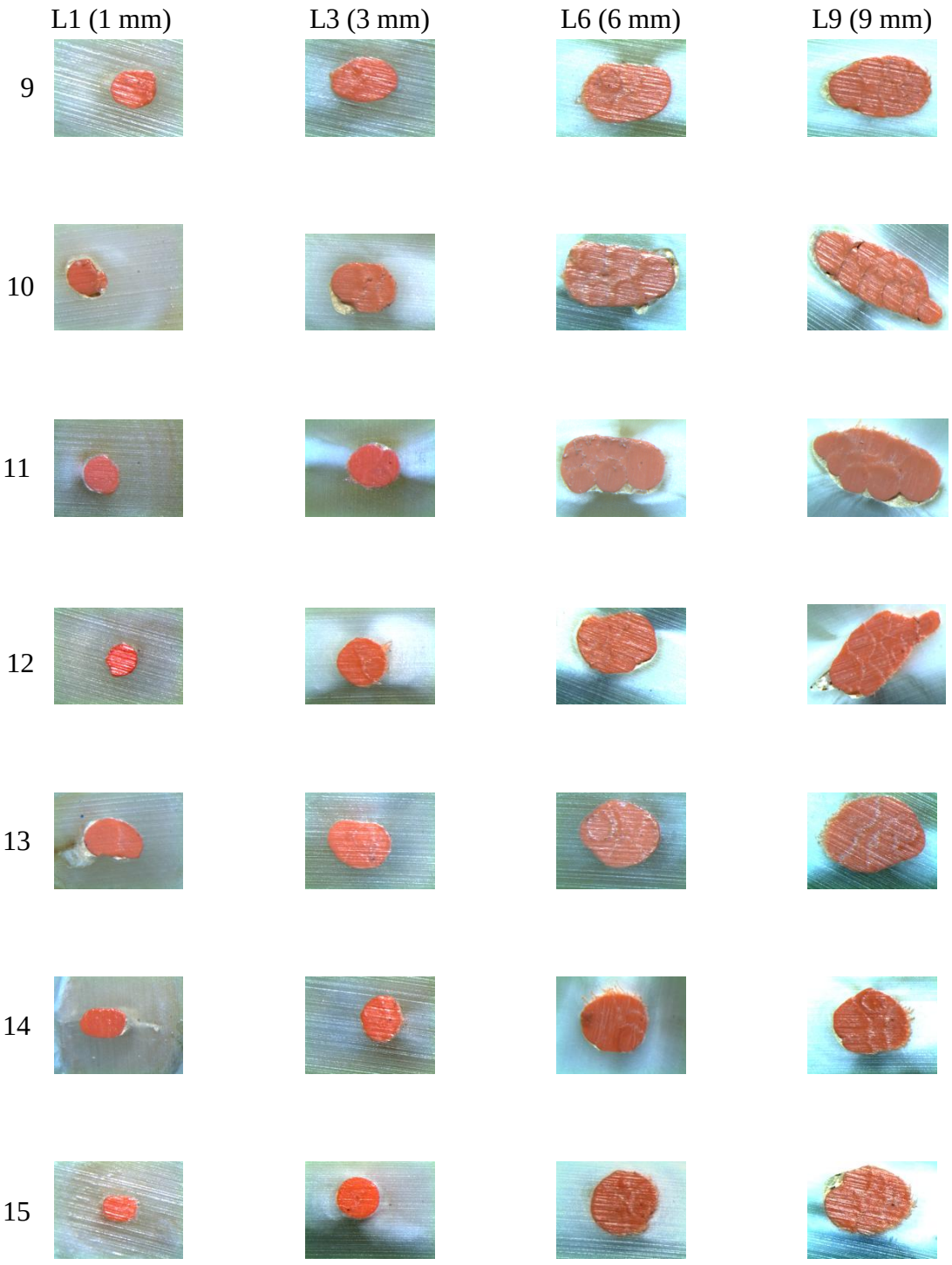


Figure 10: continued…..
(Sample 9-15)

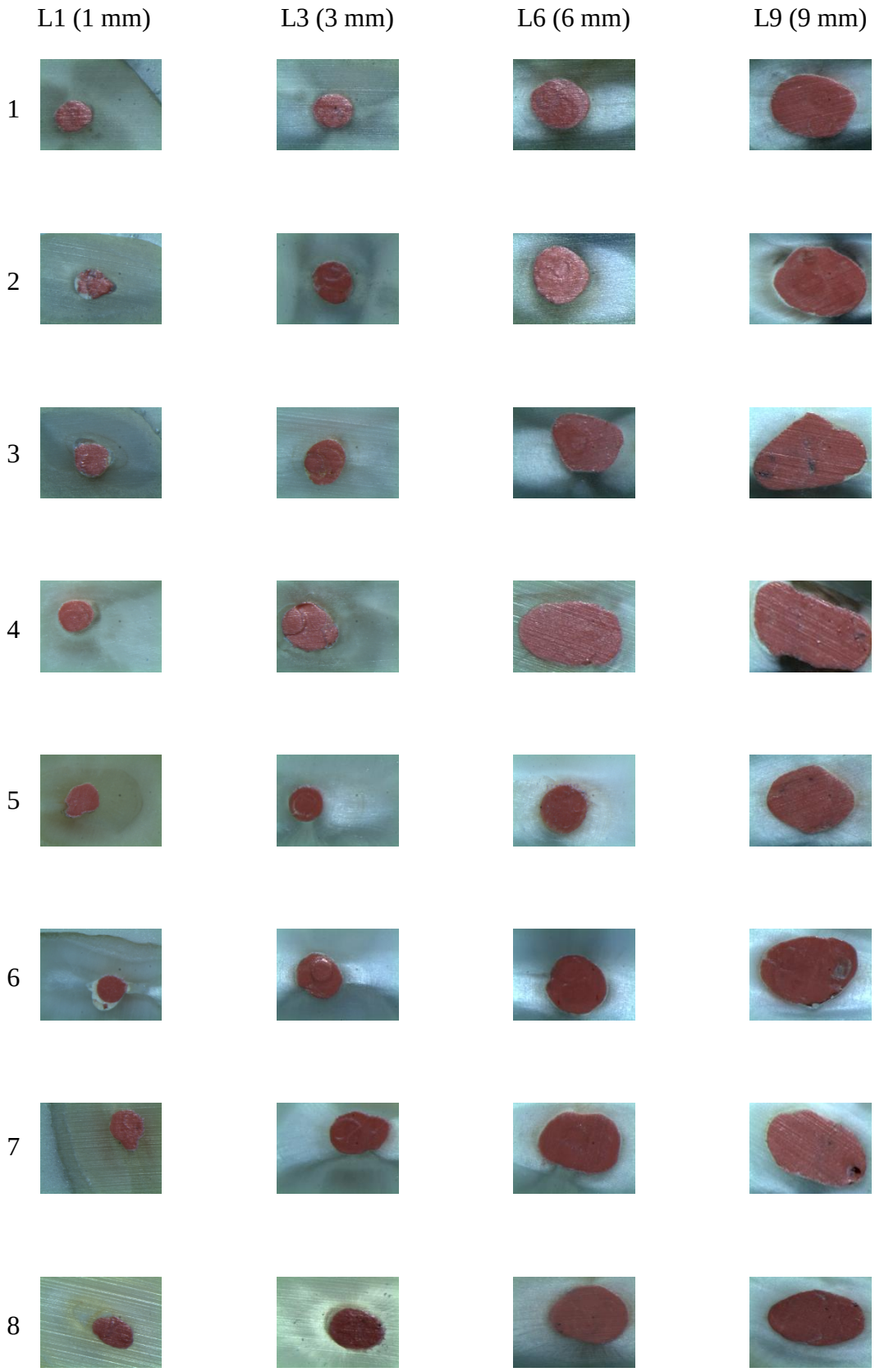


Figure 11: Stereomicroscopic images of L1, L3, L6 and L9 sections for WLC/GP (Sample 1-8)

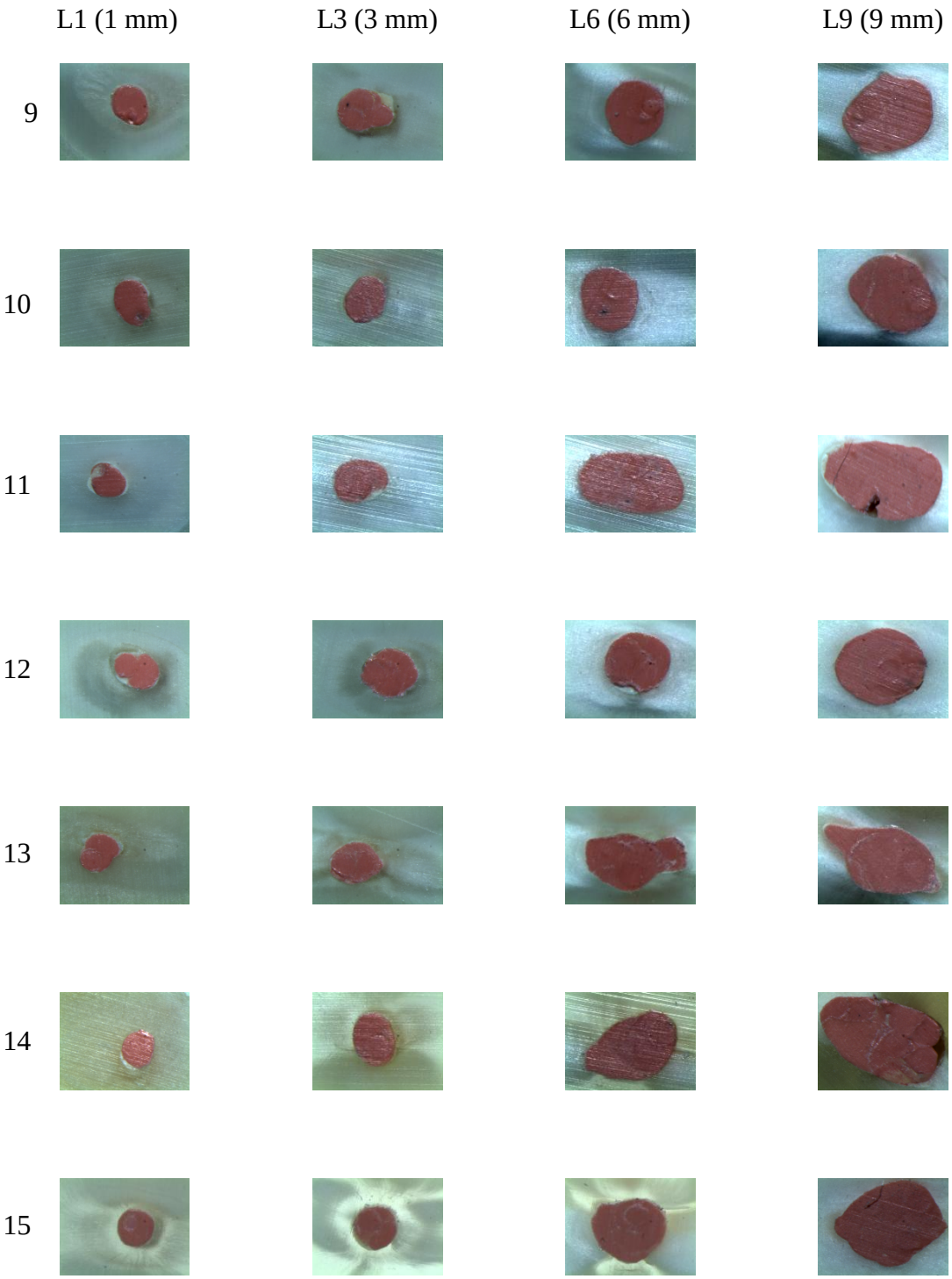


Figure 11: continued…..
(Sample 9-15)

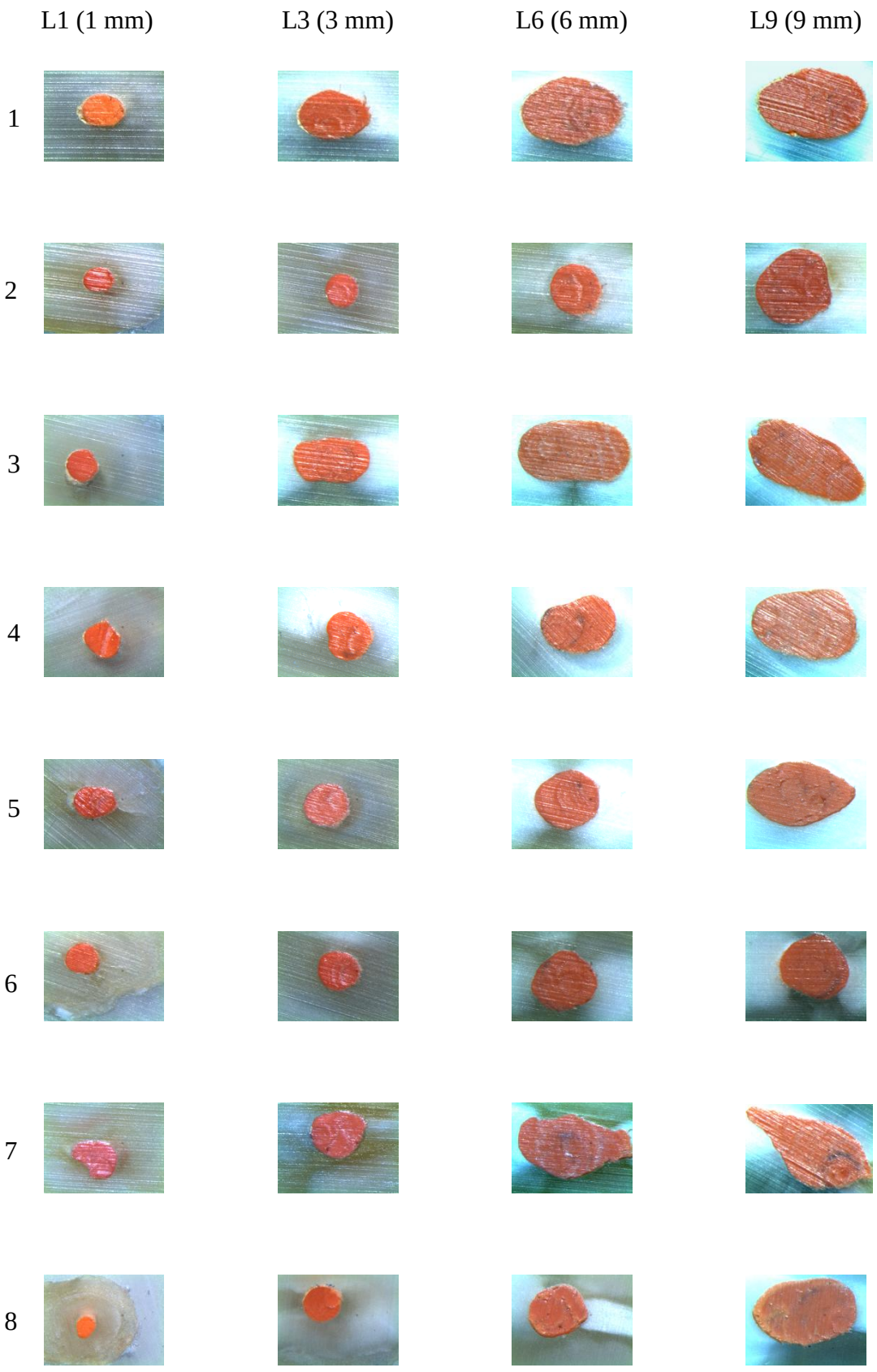


Figure 12: Stereomicroscopic images of L1, L3, L6 and L9 sections for WLC/ER (Sample 1-8)

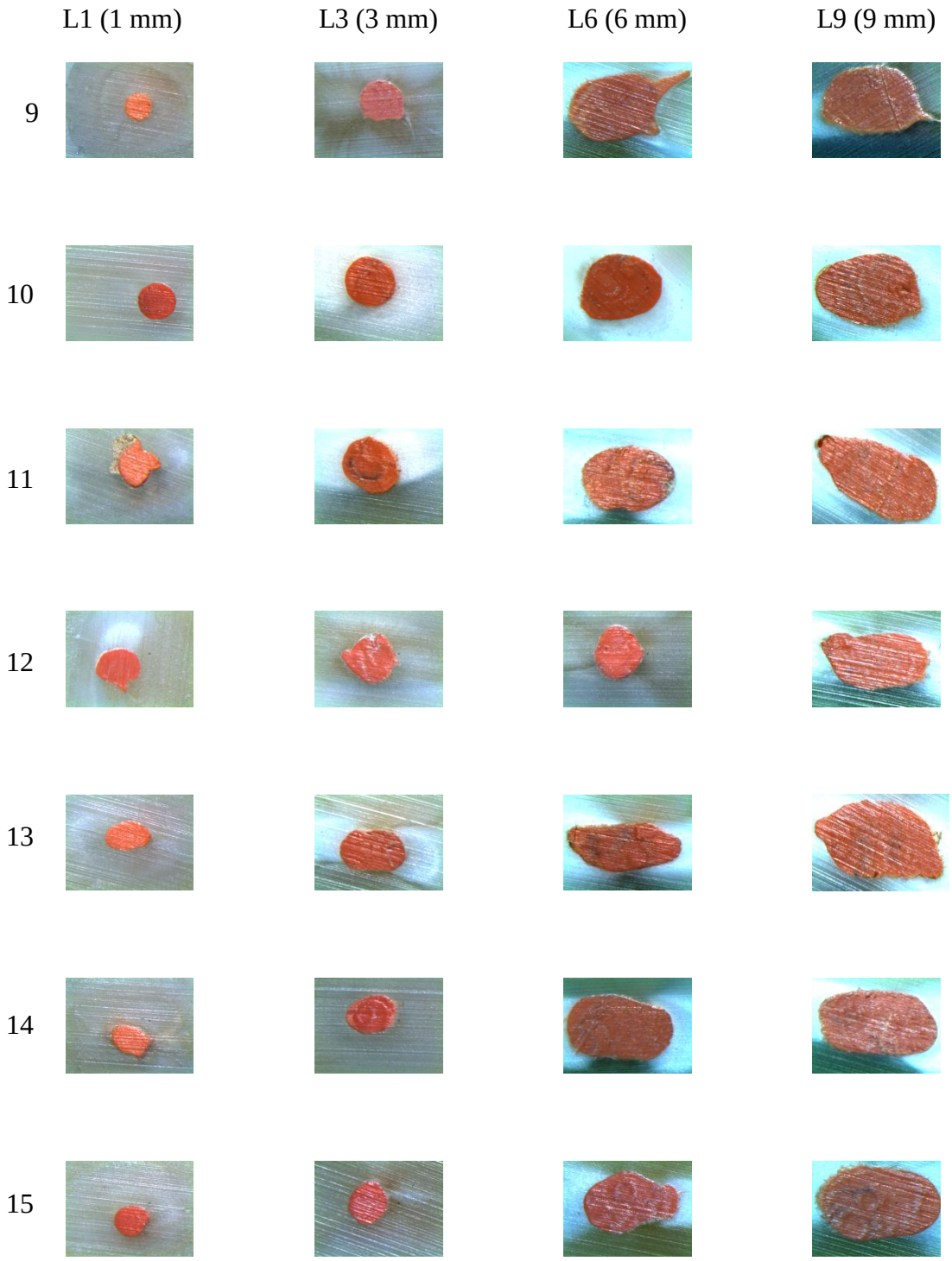


Figure 12: continued…..
(Sample 9-15)

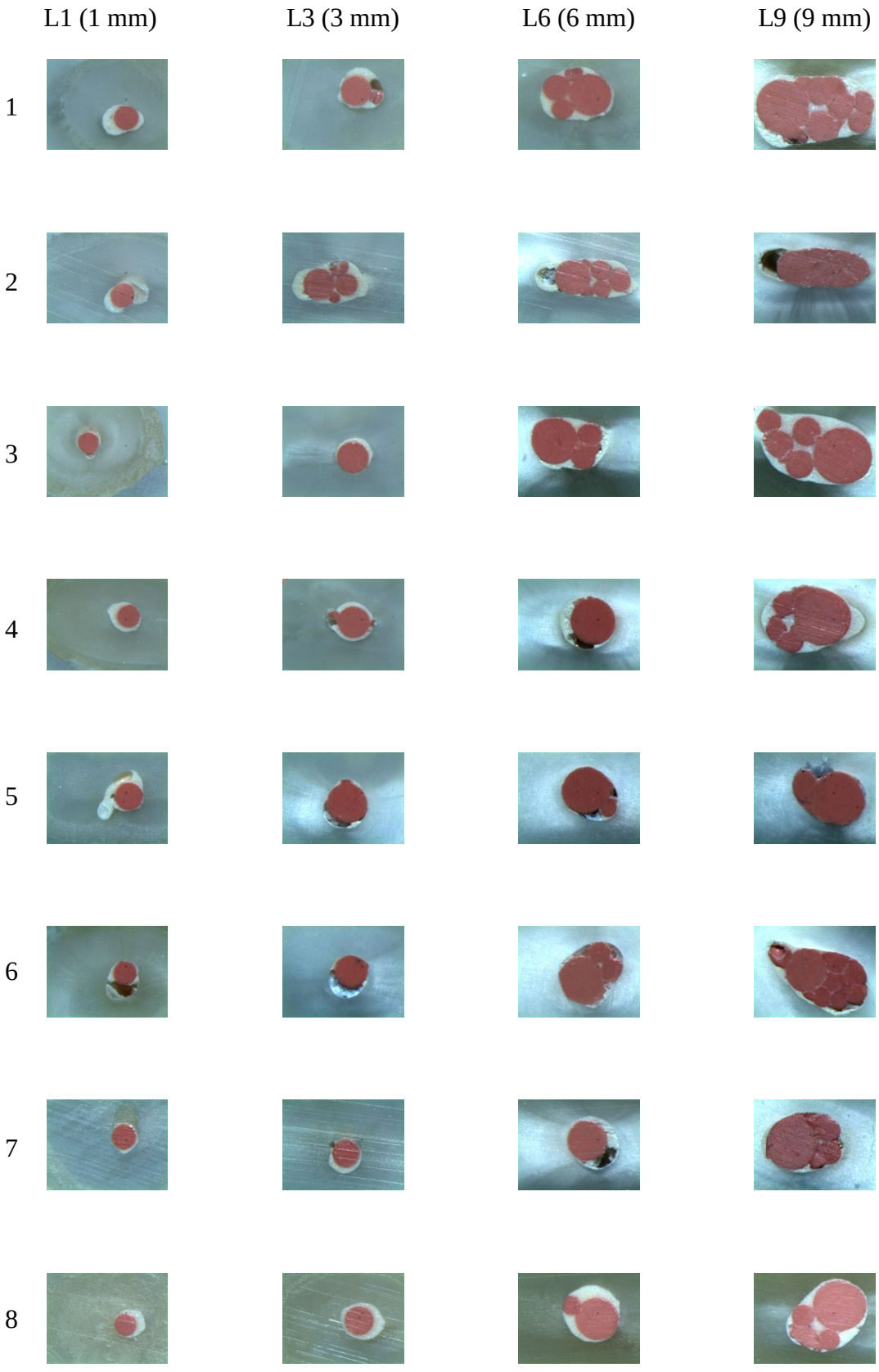


Figure 13: Stereomicroscopic images of L1, L3, L6 and L9 sections for SC/GP (Sample 1-8)

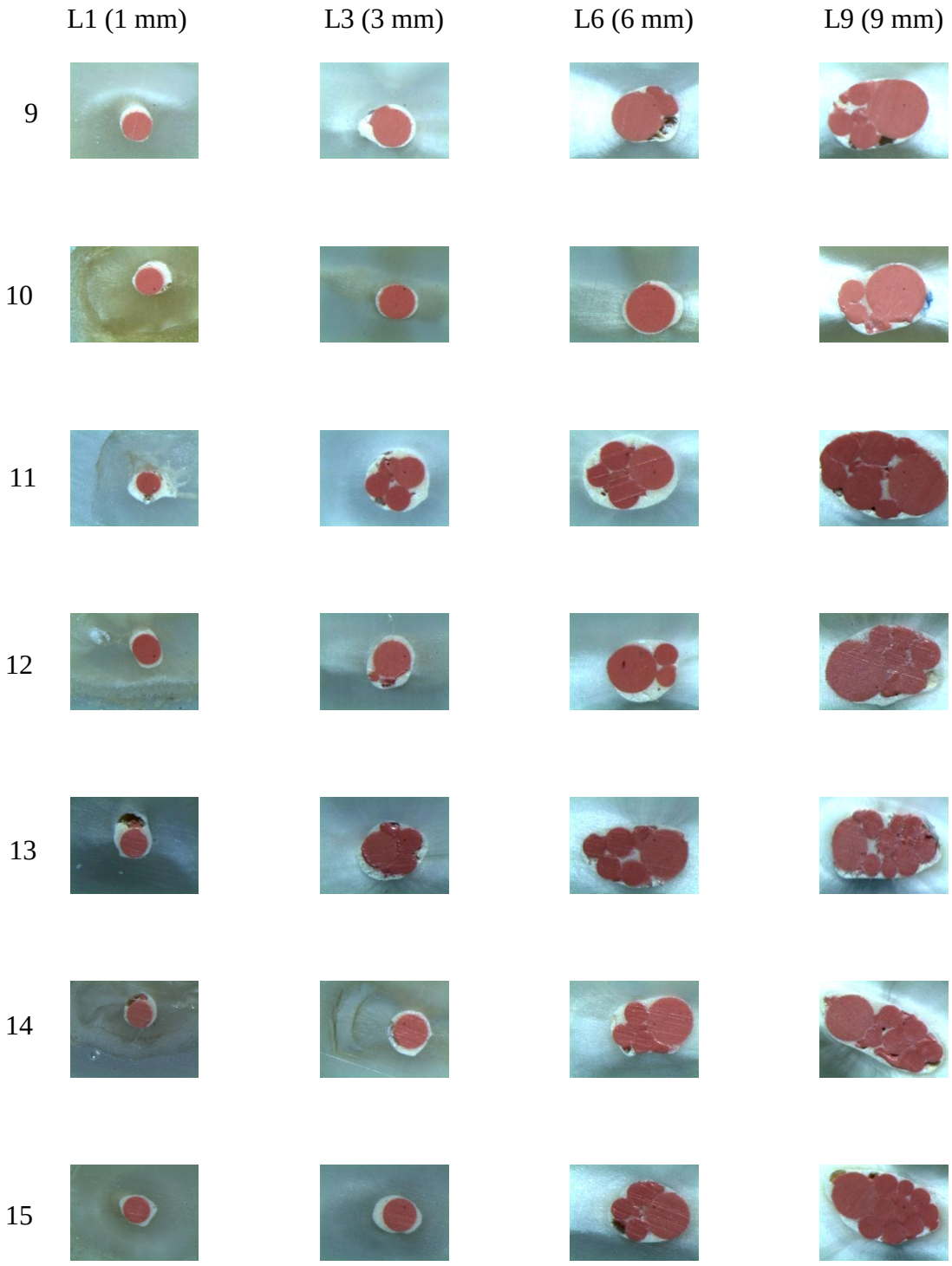


Figure 13: continued…..
(Sample 9-15)

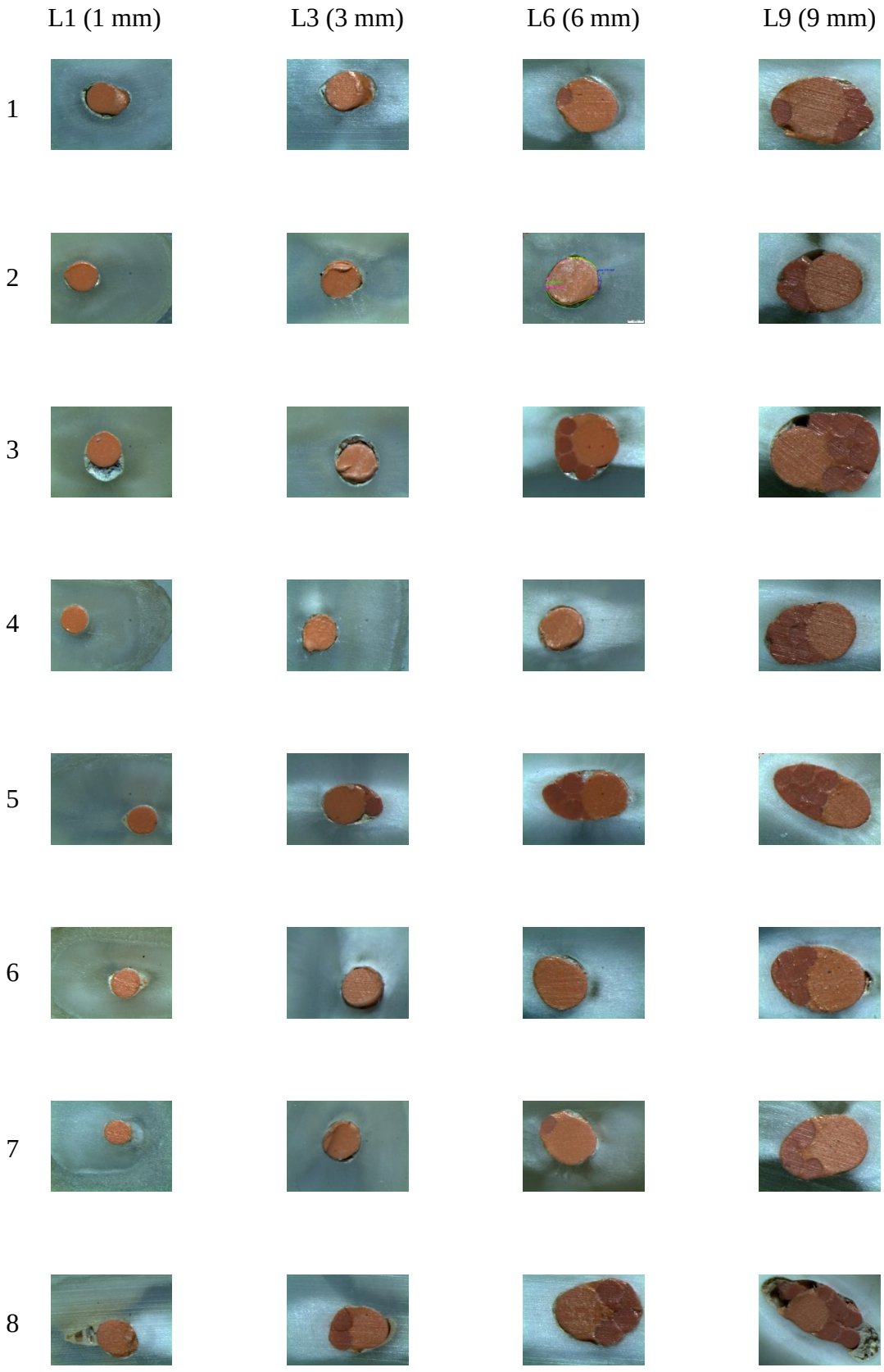


Figure 14: Stereomicroscopic images of L1, L3, L6 and L9 sections for SC/ER (Sample 1-8)

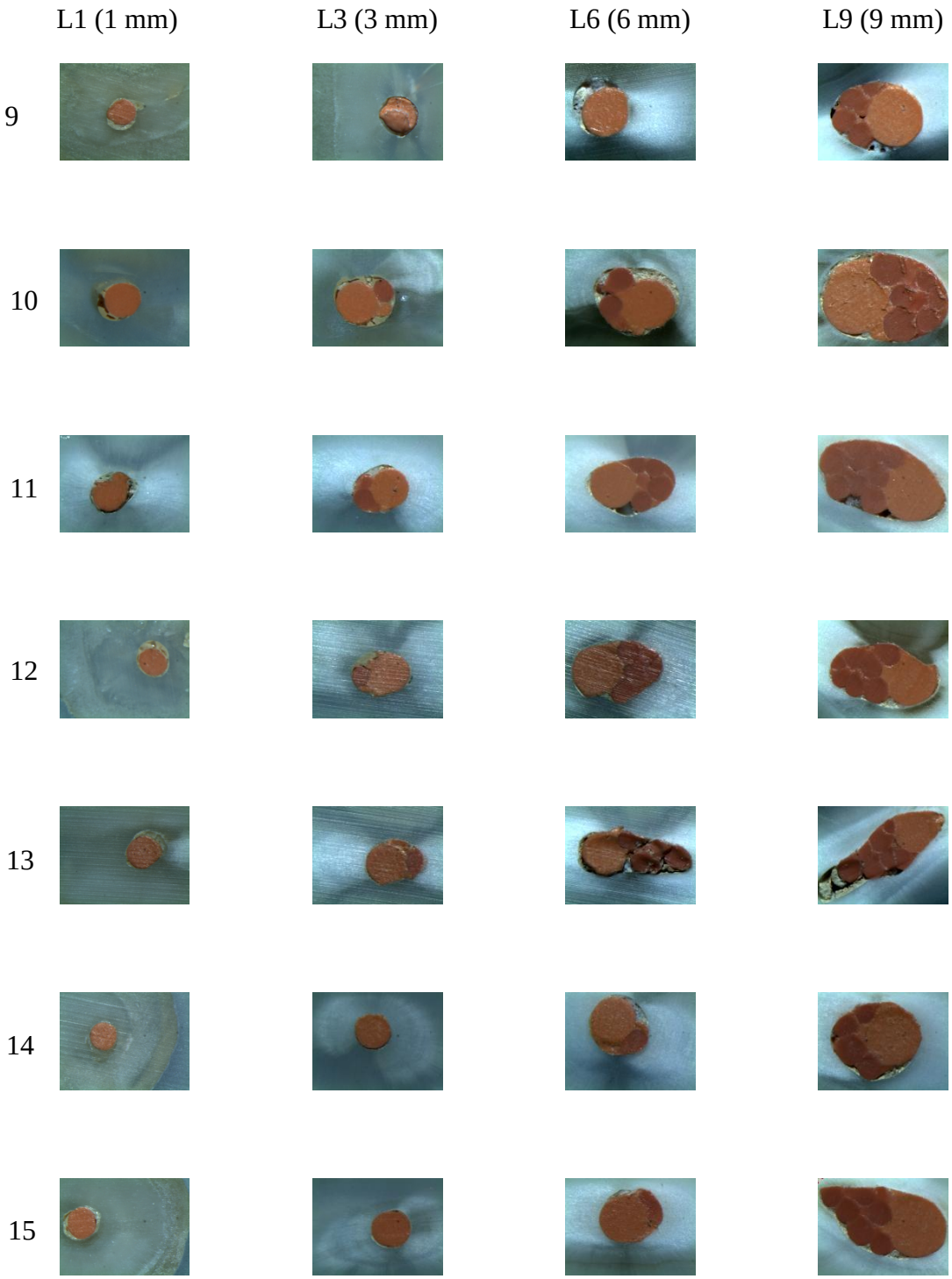
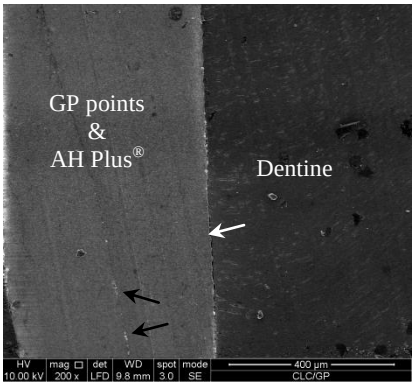
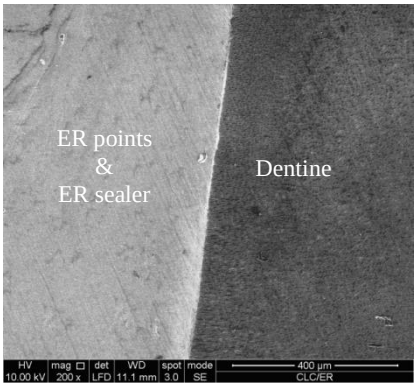


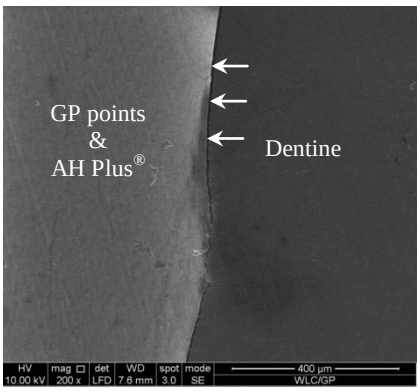
Figure 14: continued…..
(Sample 9-15)



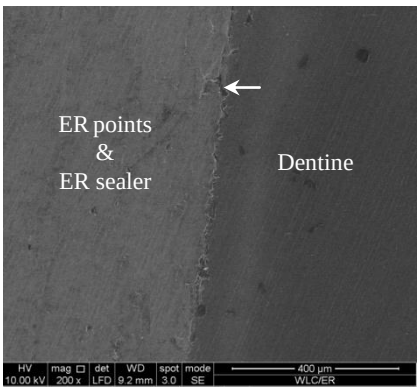
A. CLC/GP. Gap (white arrow) is evident between GP points/AH Plus® and dentine. The sealer (black arrow) is evident between GP points.



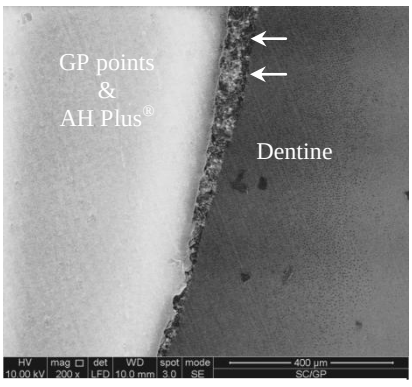
B. CLC/ER. No gap is evident between ER points/ER sealer and dentine



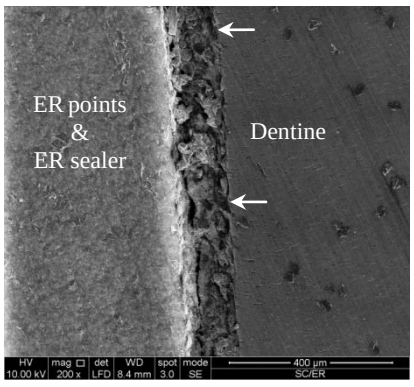
C. WLC/GP. Gap (white arrow) is evident between GP points/AH Plus® and dentine.



D. WLC/ER. Small gap (white arrow) is evident between ER points/ER sealer and dentine.

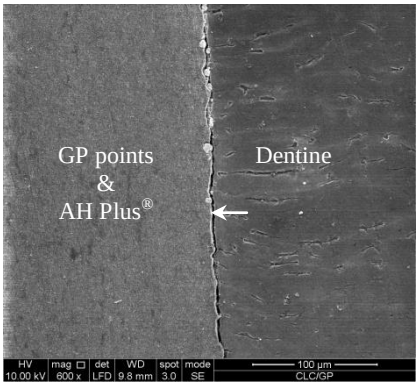


E. SC/GP. Small gaps (white arrow) are evident between GP points/AH Plus® and dentine.

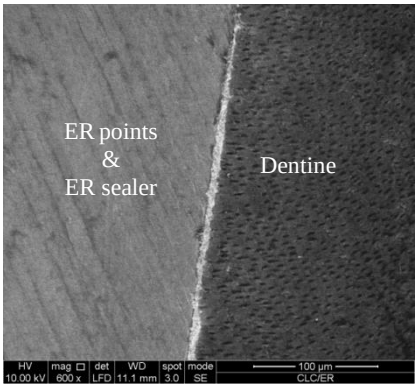


F. SC/ER. Small gaps (white arrow) are evident between ER points/ER sealer and dentine.

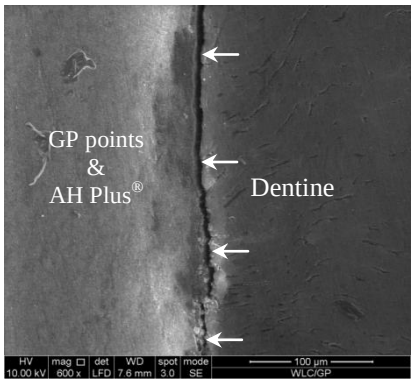
Figure 15 (A-F): Low power SEM (200×) micrograph of a longitudinal section of root filled with GP point/AH Plus® and ER point/ER sealer using CLC, WLC and SC techniques taken at a level between 1-5 mm from the apex.



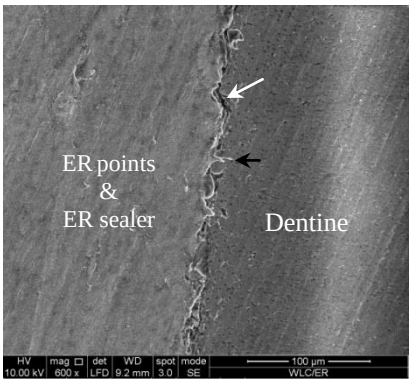
A. CLC/GP. Gap (white arrow) is evident between GP points/AH Plus® and dentine.



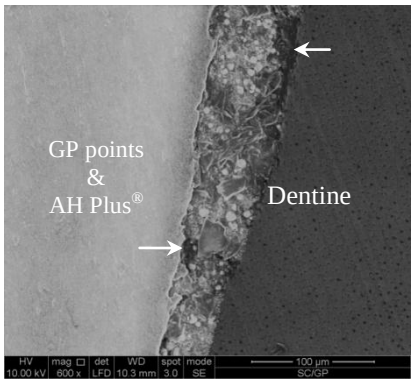
B. CLC/ER. No gap is evident between ER points/ER sealer and dentine.



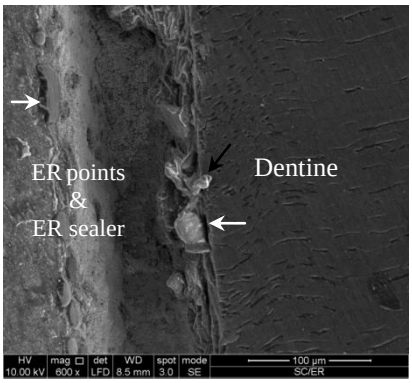
C. WLC/GP. Gap (white arrow) is evident between GP points/AH Plus® and dentine.



D. WLC/ER. Small gap (white arrow) is evident between ER points/ER sealer and dentine. The resin tags (Black arrow) are shown in the dentine area.

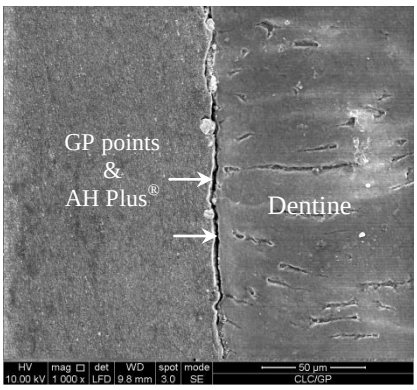


E. SC/GP. Gaps (white arrows) are evident between GP points/AH Plus® and dentine

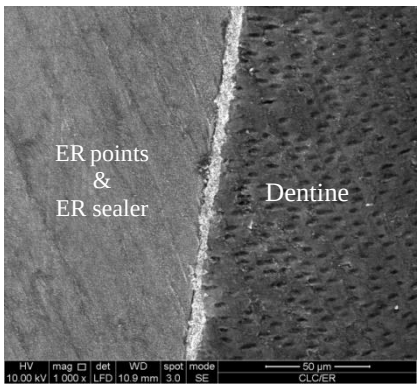


F. SC/ER. Small gap (white arrows) is between ER points/ER sealer and dentine. The resin tags (black arrow) are shown in the dentine area.

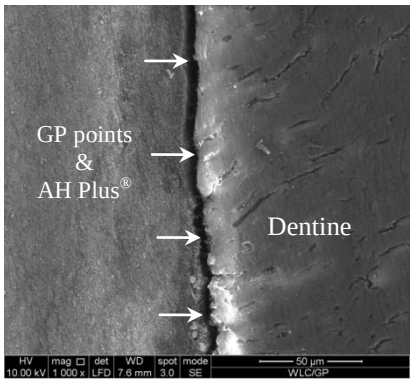
Figure 16 (A-F): Medium power SEM (600×) micrographs of a longitudinal section of root filled with GP point/AH Plus and ER point/ER sealer using CLC, WLC and SC techniques that taken at a level approximately 4 mm from the apex.



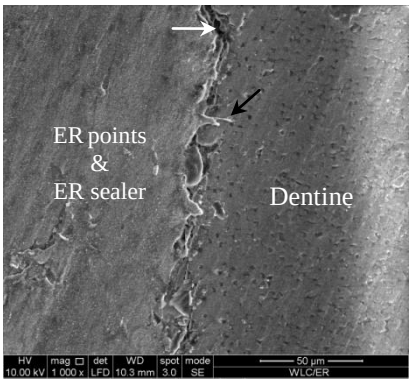
A. CLC/GP. Gap (white arrows) is evident between GP points/AH Plus® and dentine.



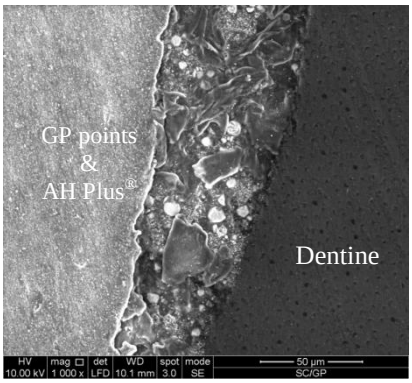
B. CLC/ER. No gap is evident between ER points/ER sealer and dentine.



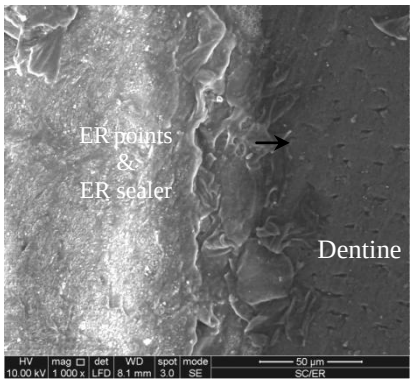
C. WLC/GP. Gap (white arrows) is evident between GP points/AH Plus® and dentine.



D. WLC/ER. Small gap (white arrow) is evident between ER points/ER sealer and dentine. The resin tags (black arrow) are shown in the dentine area.



E. SC/GP. No resin tags are shown between GP points/AH Plus® and dentine.



F. SC/ER. No gap is evident between ER points/ER sealer and dentine. The resin tags (black arrow) are shown in the dentine area.

Figure 17 (A-F): High power SEM (1000×) micrographs of a longitudinal section of root filled with GP point/AH Plus and ER point/ER sealer using CLC, WLC and SC techniques.