Immediate Loading of Mini Implants in Children and Its Impact on Quality of Life

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Introduction

Loss of anterior permanent teeth in children, whether due to trauma, caries, or developmental anomalies, can lead to aesthetic, functional, and psychosocial consequences that negatively impact oral health-related quality of life. Conventional options for tooth replacement in growing patients, such as removable prostheses, resin-bounded, autotransplantation, and orthodontic space management, may not adequately address these needs due to compliance issues and limited functional outcomes.

• Mini dental implants have emerged as a potential alternative, offering immediate loading, minimal invasiveness, and preservation of alveolar bone without interfering significantly with craniofacial growth.

• **Purpose:**
This study aimed to evaluate the clinical performance, radiographic changes, and impact on oral health–related quality of life (OHRQoL) of immediately loaded mini-implants placed in growing children for anterior tooth replacement

Materials and Methods

Fifteen healthy children aged 10–13 years were selected from the outpatient clinic of the Pediatric Dentistry Department, Faculty of Dentistry, Tanta University, Egypt. Clinical examination and panoramic radiographs were performed, followed by cone-beam computed tomography (CBCT) to assess bone density and dimensions (minimum 5 mm diameter and 13 mm length). Mini-implants (3×11.5 mm or 3×13 mm) were placed flapless using a pilot drill and hand ratchet.

Evaluation included:

• **Clinical Parameters:**
Modified Gingival Index, probing depth, and implant mobility

• **Implant Stability:**
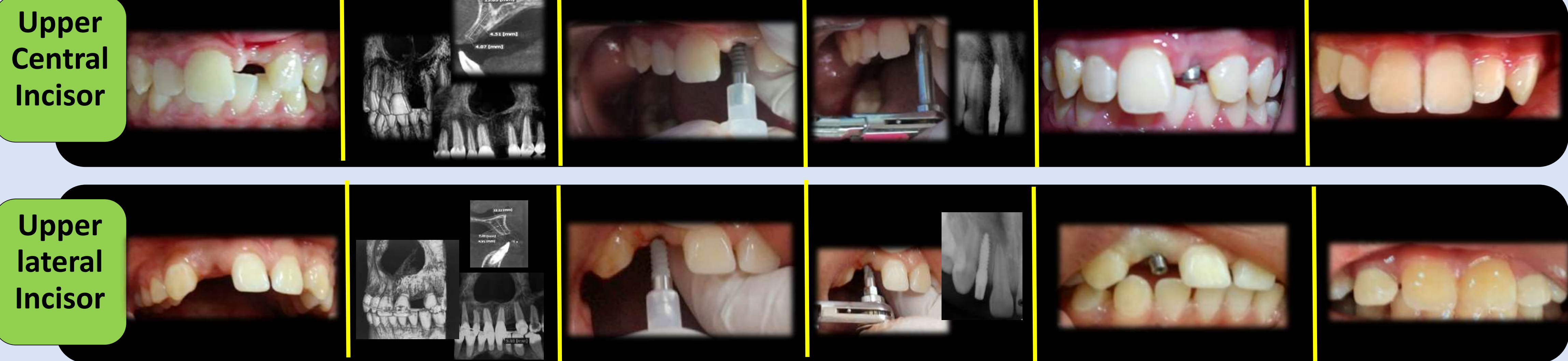Periotest values recorded over time

• **Radiographic Assessment:**
Marginal bone height via periapical radiographs at 0, 6, 12, 18, and 24 months

• **OHRQoL Assessment:**
Oral Health Impact Profile (OHIP-14) questionnaire assessing seven subscales via face-to-face interviews

Upper Central Incisor

Upper lateral Incisor

it is critical to use a mini-implant that is large enough for stability but small enough to avoid interference with alveolar growth

Implants were placed flaplessly using a pilot drill, avoiding direct contact. Insertion was completed with a driver and ratchet, and initial stability >30 N/cm was confirmed with a torque wrench.

Occlusion was assessed, rubber base impressions were taken, and long-term temporary crowns were cemented after three weeks.

Results

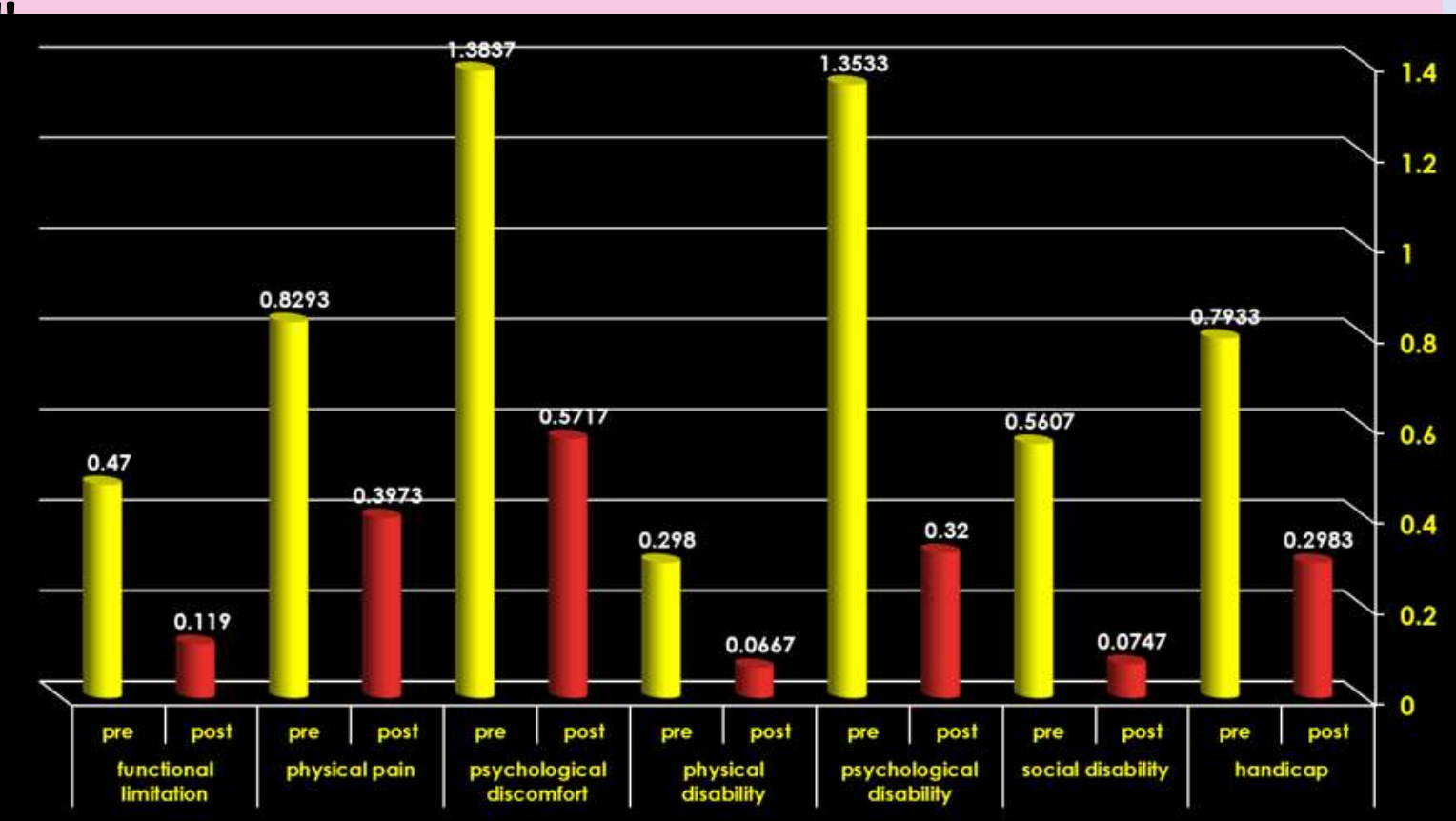### Description of demographic data of the patient

Description demographic	Date
Total number participants in study	15
Total complete	14(93.3)
Male participants	5(33.3)
Female participants	10(66.6)
Average age of participants	12+ 1
Tooth type	11central incisor 4 lateral incisors
Anatomic location	Maxilla
Implant diameter	3 mm
Implant length	11mm/13mm
Total successful	14(93.3)
Total failed	1 (6.6)

Clinical parameters:

Gingival inflammation was assessed using modified gingival index around implant

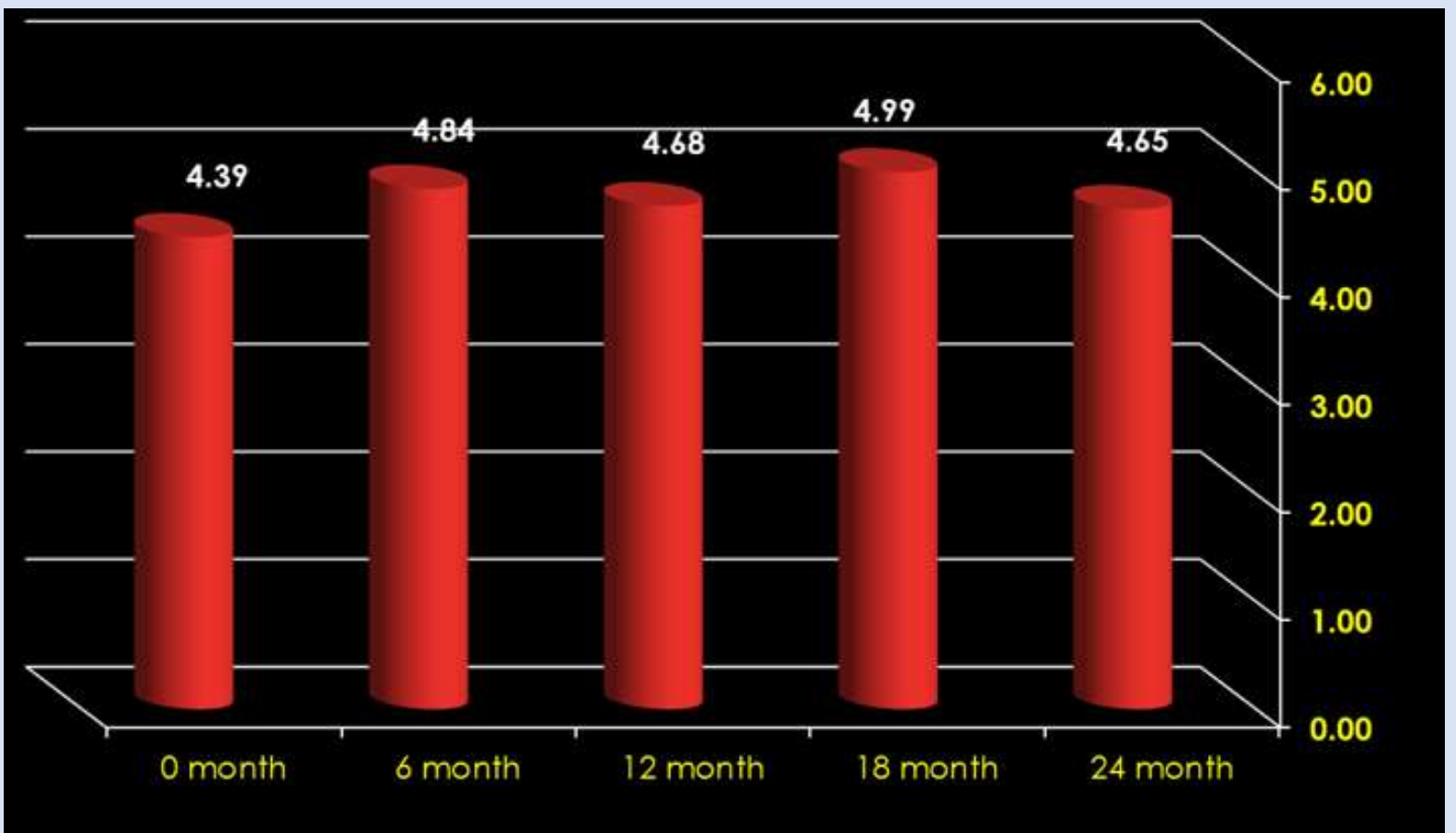| Time intervals	Mean ± std	f	P-value	Eta squared
0 month	4.5986±0.56924			
6 month	4.7321±0.59467			
12 month	4.9143±0.63592	2.63	0.098	0.513
18 month	5.2857±0.86100			
24 month	4.9793±0.93002			

Peri-implant pocket depth was recorded at zero (loading) 6, 12, 18 and 24 month.

Time intervals	Mean ± std	f	P-value	Eta squared
0 month	1.8393±0.21047			
6 month	1.8750±0.18989			
12 month	1.8214±0.20636	0.556	0.700	0.18
18 month	1.8571±0.18898			
24 month	1.9107±0.15833			

OHRQoL Assessment:

Data were collected through face-to-face interviews, where participants responded to the 14 OHIP questions using a Likert-type scale.
Responses were coded as follows:
• 4 for "very often"
• 3 for "fairly often"
• 2 for "occasional"
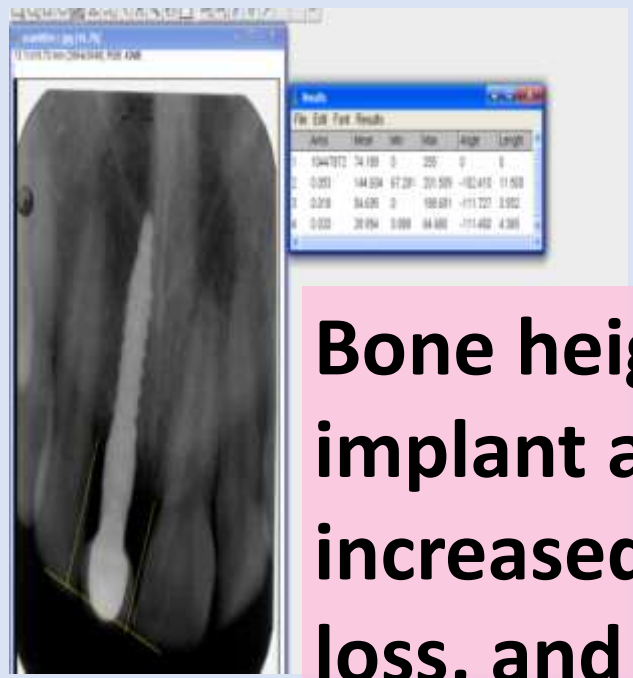• 1 for "hardly ever"
• 0 for "never."

Implant stability :

Periotest values range from (-8.0 to +50.0)
• values from -8.0 to 0.0 indicate good osseointegration, allowing implant loading,
• Values above +10.0 suggest insufficient osseointegration.

Radiographic Assessment:

Bone height was measured from the implant abutment to the ridge crest; increased distance indicated bone loss, and decreased distance indicated bone gain.

Time intervals	Mean ± std	f	P-value	Eta squared
0 month	1.1429 ± 0.36314			
6 month	1.7857±0.69929			
12 month	1.2857±0.46881	4.808	0.020	0.658
18 month	1.0714±0.26726			
24 month	1.0000±0.00000			

		Mean	N	Std. Deviation	T	df	Sig(2-tailed)
Functional limitation	Pre 1	0.4700		0.26219	6.045		0.000
	Post 1	0.1190		0.16318			0.000
Physical pain	Pre 2	0.8293		0.30030	7.193		0.000
	Post 2	0.3973		0.16351			0.000
Psychological discomfort	Pre 3	1.3837		0.24176	15.125		0.000
	Post 3	0.5717		0.19107			0.000
Physical disability	Pre 4	0.2980	15	0.19436	5.064	14	0.000
	Post 4	0.0667		0.11456			0.000
Psychological disability	Pre 5	1.3533		0.25598	24.508		0.000
	Post 5	0.3200		0.20071			0.000
Social disability	Pre 6	0.5607		0.24728	10.400		0.000
	Post 6	0.0747		0.14401			0.000
Handicap	Pre 7	0.7933		0.24728	7.146		0.000
	Post 7	0.2983		0.14401			0.000

Conclusions

The mini-implant helps stimulate the alveolar bone, preventing ridge atrophy until growth is completed. Its smaller dimensions, compared to traditional dental implants, make it a promising solution for young patients.

Recommendations

Mini-implants show promising results and have broad potential as a new modality for restoring lost teeth. Further research and longer follow-up are needed to fully validate their effectiveness.