Efficacy of Single Piece Basal Implant in Dentoalveolar Rehabilitation

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Abstract

Background: The purpose of this study is to study the effectiveness of single piece basal implant in dentoalveolar rehabilitation of partially and complete edentulous patients using IOPAR at regular intervals and observation of implant mobility ad gingival index.

Methods: The Present study was conducted in the postgraduate clinic and Implant clinic of the Department of Oral & Maxillofacial Surgery RUHS College of Dental Sciences, Jaipur to clinically evaluate the basal cortical implant. The definition of implant success was based on the following clinical and radiologic criteria:

1) Absence of clinically detectable implant mobility,
2) Absence of pain or any subjective sensation,
3) Absence of continuous radiolucency around the implant.

Hard tissue parameters using IOPA radiographs were taken using the Parallel cone technique and assessed at the time of loading 1, 3 and 6 months.

Results: The present study was done to evaluate the success of single piece basal implant in dentoalveolar rehabilitation. In the present study 50 BCS implants were placed in 15 patients (3 female and 12 male) and loaded immediately, who report to the postgraduate clinic of oral and maxillofacial surgery, which showed promising results at a follow- up of 6 months. Observation was made at time of loading(baseline), postoperatively on 1month, 3 month and 6 month, eight factors were evaluated namely mobility, periimplant radiolucency, mean probing depth, pain, implant mobility, peri-implant radiolucency, gingival inflammation, sinus discharge, marginal bone loss and paraesthesia. 42 implants show crestal bone loss, 8 implants show crestal bone gain at the time of 6 months follow up as compare to crestal bone level at the time of loading.

INTRODUCTION

The elusive dream of replacing missing teeth with artificial analogs has been part of dentistry for a thousand years. Conventional rehabilitation of partial or complete tooth loss has limitation for many people and such devices can cause eating difficulties, psychological problems and problems related to esthetics, retention and stability of prosthesis. Because of these problems, patients often suffer decreased self confidence and develop psychological problems.

Definition of Corticobasal Implants: Corticobasal implants are implants which are osseo-fixated in cortical bone areas with the intention to use them in an immediate loading protocol. The "Consensus on Basal Implants" (2018) of the International Implant Foundation applies to such corticobasal implants.

RATIONALE FOR USING BASAL IMPLANTS: According to the concept of basal implantology the jaw bone comprises of two parts the tooth bearing alveolus or crestal part and the basal bone. The crestal bone is less dense in nature and is exposed to infections from tooth borne pathologies, injuries or iatrogenic factors and is therefore subject to higher rate of resorption whereas the basal bone is heavily corticated and is rarely subject to infections and resorption. It is this, i. e. ; the basal bone that can offer excellent support to the implants because of its densely corticated nature, at the same time the load bearing capacity of the basal bone is many times higher than that offered by the spongy crestal bone. This rationale stems from Orthopedic surgery and from the experience that cortical areas are essential, since, they are resistant to resorption, as a result basal implants are also called as "Orthopedic Implants"

SURGICAL TECHNIQUE

Unlike conventional implants basal implants have a different surgical approach. The technique is simple and easy to execute and does not involve extensive drilling of bone thus avoiding thermal injury. Throughout the surgery the mode of irrigation used is external and usually for almost any case a single pilot osteotomy with a "Pathfinder Drill" is sufficient for KOS, KOS Plus and BCS implants, the kit also consists of manual drills for a controlled osteotomy preparation. Basal implantologists do not advocate raising a flap for these implants as it results in a decreased blood supply and also because of the design of these implants raising a flap is pointless, another factor to be considered is the immediate loading of these implants; a sutured site is not a favorable area to receive an immediate prosthesis

MATERIALS AND METHODS

The Present study was conducted in the postgraduate clinic and Implant clinic of the Department of Oral & Maxillofacial Surgery RUHS College of Dental Sciences, Jaipur to clinically evaluate the basal cortical implant

The definition of implant success was based on the following clinical and radiologic criteria:

1) Absence of clinically detectable implant mobility,
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Hard tissue parameters using IOPA radiographs were taken using the Parallel cone technique and assessed at the time of loading 1, 3 and 6 months.

Change in crestal bone level was measured in millimetres by comparing the radiographs which is taken at the time of loading to the most recent radiographs available for review. Changes in bone levels over time were estimated by direct measurements on non-standardized, periapical radiographs. The length (mm) of the implant was measured on the radiographs from the implant-abutment interface to the apex of the implant which standardizes the measurements and reduces the margin of error. Next, the distance between the observed crestal bone level and the implant-abutment interface was measured at the mesial and distal implant surfaces. The actual implant length was known based on manufacturing standards. To adjust the measurements for magnification error, the following equation was used to determine the corrected crestal bone levels:

Corrected crestal bone level

$$= \textbf{Measured crestal bone level} \times \frac{\textbf{actual implant length}}{\textbf{measured implant length}}$$

MATERIALS AND EQUIPMENT / ARMAMENTARIUM

The following standardized materials and equipment/armamentarium were used for the purpose of study.

a) The implant system used in this study was Simpladent Implant System; Implants were of lengths 10, 12, 14, 17, 20, 23, 26, 29 mm. The implants were available in diameter of 3. 6mm.

b) Surgical Armamentarium for Surgery

1. Surgical Guide Drill: Pilot drill was generally used to initiate the bone drilling.
2. Surgical Twisted Drills: Surgical twist drills of various diameters ranging from 2. 0 mm to 2. 8mm were used in sequence to prepare the site.
3. Depth Gauge/Paralleling Pins: These gauges were used to obtain parallel preparation and to guide the direction of drilling preparation. They were also used to measure the depth of the surgical preparation for implant placement.
4. Physiodispenser and Reduction handpiece with internal Q irrigation: used for bone drilling
5. Hex Ratchet: Hex ratchet was used to engage the fixture insertion tools to screw the implant in its proper position.
6. Standard Diagnostic Tools; Mirror, Probe, Tweezers, Tooth tissue holding forceps, needle holder and scissor were used.

METHOD

All patients reporting to the outdoor patient department were evaluated for implant insertion. The study comprised of 15 patients for 48 implants (age range from 18 to 72 years) were selected for implant placement. Patients were accepted into the study based on the following

Inclusion Criteria

- Patient above age of 18 years and medically fit.
- Two stage implant or bone augmentation has failed.
- All kind of bone atrophy.
- Poor prognosis of teeth or missing teeth.
- Also cases where alveolar bone is lost.

Exclusion Criteria

- Medical condition; Medically unfit patient
- Pt. with large preiapical pathology
- Medicines;drugs like Biphoshphonates
- Irradiated cancer pt.
- Any other dental or medical contraindication
- If immediate loading is contraindicated. Like deep bite, bruxism etc.

The baseline clinical examination consisted of a thorough medical and dental history, general and oral health status, assessment of future implant site. The available vertical, mesiodistal and labiolingual bone dimension were determined by palpation, radiograph. Intraoral periapical radiographs and CBCT were done to evaluate the volume of remaining bone. In order to prevent infection all surgical procedures were performed under strict aseptic conditions with greatest attention paid for preservation of implant bed. The dental unit, instrument tray, patient, operating assistants were covered with sterile drapes. Sterile surgeon gowns face masks, gloves and instruments were indispensable. The surgical armamentarium including the tool kit was autoclaved.

The written and informed consent was taken from the all subjects prior to the start of the procedure.

Preparation for surgery was made according to standard protocols.

Amoxicillin (1 g) and dexamethasone (8 mg) were administered 1 hour prior to surgery. Following administration of local anesthesia (2% xylocaine with 1: 80, 000 adrenaline). Teeth were carefully luxated and removed with forceps. Care was taken not to fracture the buccal plate of bone and to retain gingival tissue attachment at the mesial and distal crestal bone.

Extraction sockets were debrided with hand instruments to remove granulation tissue if required and prepared for implantation.

In case of healed socket Basal implantologists do not advocate raising a flap for these implants as it results in a decreased blood supply and also because of the design of these implants raising a flap is pointless,

another factor to be considered is the immediate loading of these implants; a sutured site is not a favorable area to receive an immediate prosthesis.

PLACEMENT OF IMPLANTS AND IMPRESSION MAKING

The oral cavity was rinsed with 1% Povidone Iodine mouth wash prior to the implant placement procedure. Local infiltration with 2% Lignocaine and 1:80000 Adr was done for mandibular procedures. However, for maxillary procedures, a nerve block along with local infiltration, akin to a dental extraction procedure was carried out. A straight surgical handpiece with a physio dispenser with 1:1 torque and 20000 rpm were used to drill the osteotomy. The path finder (pilot) drill was used in mandibular anterior region where the bone appeared to be very hard, however for all other sites the osteotomy was done using a 2mm (30/40mm) twist drill directly. The osteotomy depth and direction were decided intraop depending on the tactile feedback indicating penetration of the second / third cortical bone.

Various principles of cortical engagement were used in order to firmly place the implants in the residual alveolar ridge. The implant heads were subsequently bent to achieve approximate parallelism using the insertion adapter and or ratchet. No torque measuring device was used in our study, the firmness of the implant was determined empirically.

Pickup impression was made after placement of the impression caps on the implants using addition silicone impression material on stock trays. In case of full mouth restorations or long span segments the impression caps were stabilized using light cure composite material. The occlusal reduction of the implants was then carried out for single tooth and segment cases in order to remove occlusal interferences, this however was not required to be done in full mouth rehabilitation cases. The patient was prescribed broad spectrum antibiotics as per the following regimen: Tab Amoxicillin + Clavulanic acid 1. 2 gms BD, Tab Tinidazole 500 mg BD, Tab Ibuprofen 400 mg + Paracetamol 325 mg, Tab B Complex OD, and Tab Ranitidine 150 mg BD. An OPG was done to verify the implant placement.

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ARMAMENTARIUM

Observation and results: The present study was done to evaluate the success of single piece basal implant in dentoalveolar rehabilitation. In the present study 50 BCS implants were placed in 15 patients (3 female and 12 male) and loaded immediately, who report to the postgraduate clinic of oral and maxillofacial surgery, which showed promising results at a follow- up of 6 months. The observed factors were graded as:

Observation were made at time of loading(baseline), postoperatively on 1month, 3month and 6 month, eight factors were evaluated namely mobility, periimplant radiolucency, mean probing depth, pain, implant mobility, peri-implant radiolucency, gingival inflammation, sinus discharge, marginal bone loss and paresthesia.

Pain (VAS)	0 - No pain 1- 3-mild pain 4 -7 moderate pain 8-10 severe pain
Swelling	Present = 1 Absent = 0
Implant Mobility	Present = 1 Absent = 0
crownMobility	Present = 1 Absent = 0
Peri-implantradiolucency	Present = 1 Absent = 0
MeanProbingdepth	in mm.
Gingivalinflammation	No inflammation = 0 Mild inflammation = 1 Moderate inflammation = 2 Severe inflammation = 3
Sinus discharge	Present = 1 Absent = 0

Intra group comparision was done using repeated measures ANOVA(for x>2 observations)
Comparision of frequencies of categories of variables with groups was done using chi-square Test
For all the statistical tests, p<0. 05 was considered to be statistically significant, keeping α error at 5% and β error at 20%, thus giving a power to the study as 80%.
* = statistically significant difference (p<0. 05)
** = statistically highly significant difference (p<0. 01)
# = non significant difference (p>0. 05) … for all tables

TABLE SHOWING MEAN AGE OF THE SUBJECTS

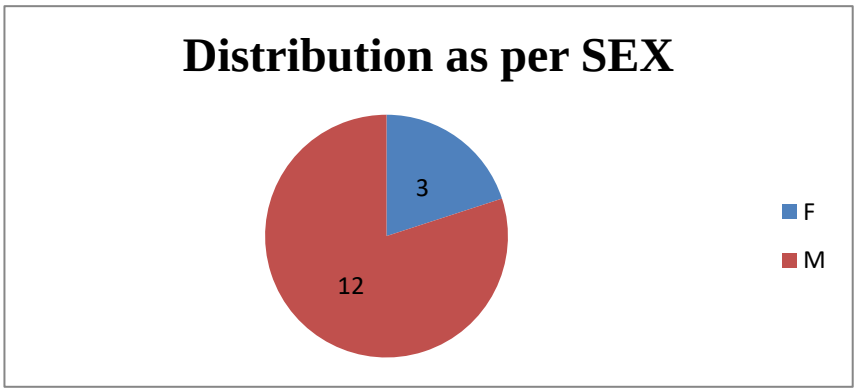
	N	Minimum	Maximum	Mean	Std. Deviation
AGE	15	17	78	41. 73	21. 319

Age of participants was in between 17-78 years. the mean age was 41+-21

FREQUENCY TABLES

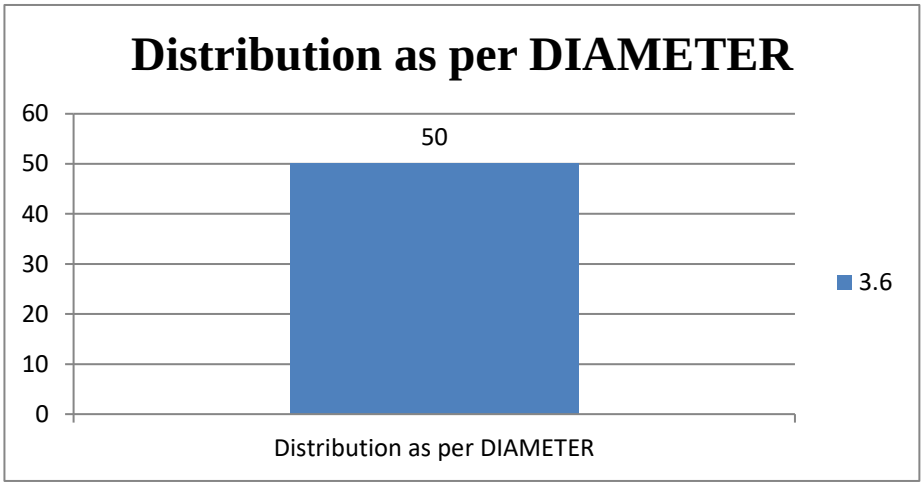
Distribution as per SEX

	Frequency	Percent
F	4	36
M	11	80
Total	15	100.0



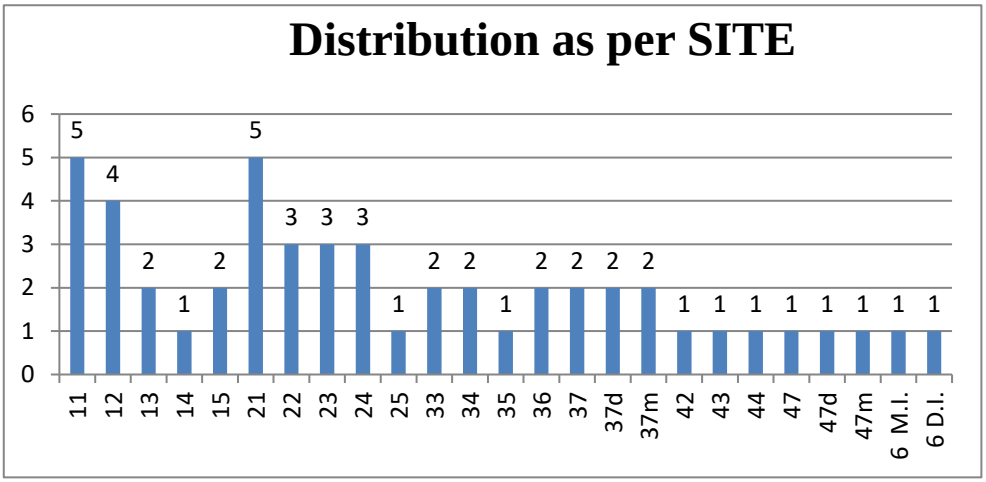
Distribution as per SITE (tooth no.)

	Frequency	Percent
11	5	10. 0
12	4	8. 0
13	2	4. 0
14	1	2. 0
15	2	4. 0
21	5	10. 0
22	3	6. 0
23	3	6. 0
24	3	6. 0
25	1	2. 0
33	2	4. 0
34	2	4. 0
35	1	2. 0
36	2	4. 0
37	2	4. 0
37d	2	4. 0
37m	2	4. 0
42	1	2. 0
43	1	2. 0
44	1	2. 0
47	1	2. 0
47d	1	2. 0
47m	1	2. 0
6 M. I.	1	2. 0
6 D. I.	1	2. 0
Total	50	100. 0



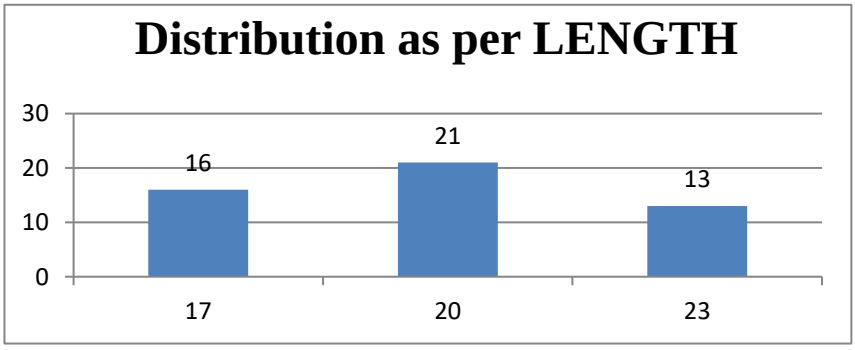
Distribution as per DIAMETER (in mm.)

	Frequency	Percent
3. 6	50	100. 0



Distribution as per LENGTH

	Frequency	Percent
17	16	32. 0
20	21	42. 0
23	13	26. 0
Total	**50**	**100.0**



Time has been denoted as

1. Baseline
2. 1M
3. 3M
4. 6M

Analysis of pain with the help of visual analogue scale

	TIME	Mean	Std. Deviation	p Value
PAIN	1	1. 90	. 735	
	2	. 00	. 000	
	3	. 14	. 351	. 000**
	4	. 00	. 000	

Pain scores are discrete values, Intra group comparison was done using repeated measures ANOVA (for >2 observations). There was a statistically highly significant difference seen for the values between the time intervals as the p value is 0. 000 (p<0. 01), and according to VAS score it was noted that only mild pain felt during surgery. Pain was gradually decreased with time which showed statistically significant results and success of the surgery, just like pain mild swelling noted immediately after implant placement that swelling was gradually decreased with time period, three months after loading few patients feel pain which might be due to high points on prosthesis, which get corrected and reduction in pain at six months which showed statistically significant

Distribution of probing depth at different time period

	MEAN	S. D.	p VALUE	INF
BASE LINE	0. 32	. 513	. 000	HS
1 MONTH	0. 52	. 614	. 000	HS
3 MONTHS	0. 64	. 693	. 000	HS
6 MONTHS	0. 98	. 685	. 000	HS

Table showed probing depth which was noted at the time of loading and consecutive follow ups. probing depth increases with time which was noted 0. 32+-0. 51mm at the time of loading and which was increases up to 0. 98-+ 0. 68 at the time of 6 month follow up. there was a statistically highly significant difference seen for the values between the time intervals as the p value is 0. 000 (p<0. 01) for periodonta pocket with higher values at 6 month.

Distribution of gingival inflammation at different time period

	MEAN	S. D.	p VALUE	INF
BASE LINE	. 06	. 240	. 164	NS
1 MONTH	. 20	. 404		NS
3 MONTHS	. 16	. 370		NS
6 MONTHS	. 10	. 303		NS

Table showed gingival inflammation at different follow up period. Gingival inflammation was gradually decreased with the time period which showed non-statistically significant results.

Distribution of marginal bone level at different time periods

	MEAN	S. D.	p VALUE	INF
BASE LINE	3. 000000	2. 1505585	. 000	HS
1 MONTH	4. 000816	1. 7479426		HS
3 MONTHS	4. 379400	1. 7831735		HS
6 MONTHS	4. 773958	1. 6918449		HS

Table shows the bone level changesat different time period which is measured at mesial/distal side for implants placed ad immediatelty loaded. Table shows the bone level changes at different time period (Baseline, 1, 3and 6months). Marginal boe loss increases with time which was noted 3. 0+-2. 1mm at the time of loading and which was increases up to 4. 77+- 1. 6 at the time of 6 month follow up. there was a statistically highly significant difference seen for the values between the time intervals as the p value is 0. 000 (p<0. 01) for marginal bone loss with higher values at 6 month.

Total 50 implants placed, 42 implants shows crestal bone loss, 8 implants shows crestal bone gain at the time of 6 months follow up as compare to crestal bone level at the time of loading

COMPARISON OF CATEGORICAL VARIABLES WITH TIME

IMPLANT MOBILITY * TIME

		TIME				Total	Chi square value	p value
		1	2	3	4			
IMPLANT MOBILITY	**0**	50	50	50	50	200	---	---
	Total	50	50	50	50	200		

Table showed mobility-wise success at the time of loading, 1, 3 and 6months after loading. There was no any mobility noted after loading of implant. Not a single implant was mobile or failed

a. No statistics are computed because data (implant mobility) is a constant

PERIIMPLANT RADIOLUCENCY TIME

		TIME				Total	Chi square value	p value
		1	2	3	4			
PERIIMPLANT RADIOLUCENCY	0	50	50	50	50	200	---	---
	Total	50	50	50	50	200		

Table showed peri-implant radiolucency wise success of implant, At the time period of 6 months no implant shows periimplant radiolucency

No statistics are computed because IMPLANT MOBILITY is a constant

SUPURATION TIME

		TIME				Total	Chi square value	p value
		1	2	3	4			
SUPURATION	0	50	50	50	50	200	---	---
	1	0	0	0	0	0	000	---
	Total	50	50	50	50	200		

Table showed suppuration wise success of implant, At the time period of 6 months no implant shows sius discharge

No statistics are computed because data is a constant

PARASTHESIA TIME

		TIME				Total	Chi square value	p value
		1	2	3	4			
PARASTHESIA	0	50	50	50	50	200	---	---
	1	0	0	0	0	0	000	---
	Total	50	50	50	50	200		

Table showed parasthesia wise success of implant, At the time period of 6 months no implant shows parasthesia

No statistics are computed because data is a constant

SUMMARY AND CONCLUSION

The present study was done to evaluate efficacy OF SINGLE PIECE BASAL IMPLANT IN DENTOALVEOLAR REHABILITATION. The osteotomy was performed and 50 implants were placed in 15 patients (11 male and 4 female) who reported to the Postgraduate Clinic of oral and maxillofacial surgery department. Observation was made post-operatively as the baseline, further observations were made at follow up visits at 1, 3 and 6 months interval from the baseline. After stage II surgery eight factors were evaluated namely pain, implant mobility, peri-implant radiolucency, mean probing depth, gingival inflammation, sinus discharge (suppuration), parasthesia and marginal bone loss. All the fifty implants were placed using a high torque hand piece to prevent the drill from stopping while drilling. Drilling was done at the rate of 1000-1500rpm with continuous irrigation using chilled saline to avoid the overheating of the surrounding bone. In order to control the speed of drilling, the control box knob was set at the level of 1000 rpm. All implants were snugly fitted using strict asepsis.

In the present study all the 50 implants were free of mobility, peri implant radiolucency, sinus discharge for the first 4-6 months. All the 50 implants were perfectly engaged In cortical bone.

The mean probing depth was evaluated by Williams periodontal probe at 1st, 3rd month and 6th month and there was no significant difference in mean probing depth taken at various interval of time for both groups.

The assessment of changes in marginal bone height and mobility is considered an important parameter in evaluating implant success. In this study, with the radiographs taken as a baseline the bone level at mesial /distal areas and there was noted some amount of loss in crestal bone level as compare to bone present at the time of loading. The overall survival rate of implants in present study was 100%) which is in accordance with most of the long term clinical studies done on implants.

Overall summary can be drawn from this study that the implants placed either in extraction/healed socket will heal predictably and there are reductions in the treatment time required. After extraction of teeth, bone present at a site will heal and remodel till 6 months to 1 year. So there is change in bone level

around implant in some amount either gain or loss is predictable and natural. To conclude we can say that though the survival rate in present study was good, study shows some amount of loss in crestal bone level and there is no significant difference found in healing and crestal bone level in both groups till 6 months of follow up, yet since the study was of a very short duration with a small sample size and no histological evaluation was done to measure the crestal bone level changes and bone implant integration and the success rate of the implants, Further longitudinal clinical studies with large sample size and also with histological evaluation are required to actually assess the changes in crestal bone level around implants.

THUS WE CAN CONCLUDE THAT….

BASAL IMPLANT IS SUCCESSFUL TREATMENT MODALITY IN CASES OF IMMEDIATE LOADING

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