

Recent development on Magnetic Dentistry

- 1) Introduce of Magnedesign corp.**
- 2) Background of dental magnetic attachments**
- 3) Development of strong type dental magnetic attachment**
- 4) Development of thin type dental magnetic attachment**
- 5) MRI keeper**
- 6) Summary**

Sep.5th.2025

Dr. Yoshinobu. Honkura
Magnedesign Corp.

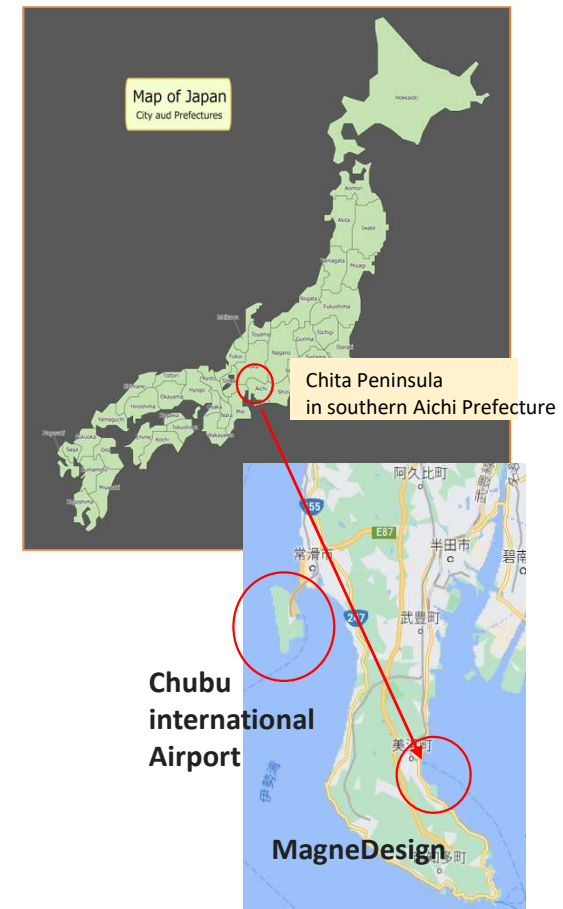
MagneDesign Corporation (MDC)

MDC is a Pioneer to develop the 21st century of magnetics

Magnedesign Mihama Laboratory



MagneDesign is located in the southern part of Aichi prefecture.



【History】

- 2012 – Dr. Yoshinobu Honkura established MDC
- 2015 – Discovered **GSR sensor principle**
Introduced by NHK report
- 2016 – Expanded and built a clean room
- 2020 – developed ASIC type GSR sensor products
- 2022 – Established **a Mihama research institute**
- 2023 – sold out Magteeth and nT sensor

Magnedesign Mihama Laboratory

World-Class Magnetics Research Facilities Researcher :16 officer:8

Laboratory1 :New Alloy Development



Dr.三嶋 大岩

Laboratory2 :amorphous wire Development



菊池、江島

Laboratory 3:Clean room



工藤・大槻・中島

Laboratory 4: GSR Sensor Development



本蔵、Dr.疋島、水野

Laboratory 5 : magnet and Motor Development



吉松、水野

Laboratory 6 Dental Magnet Development

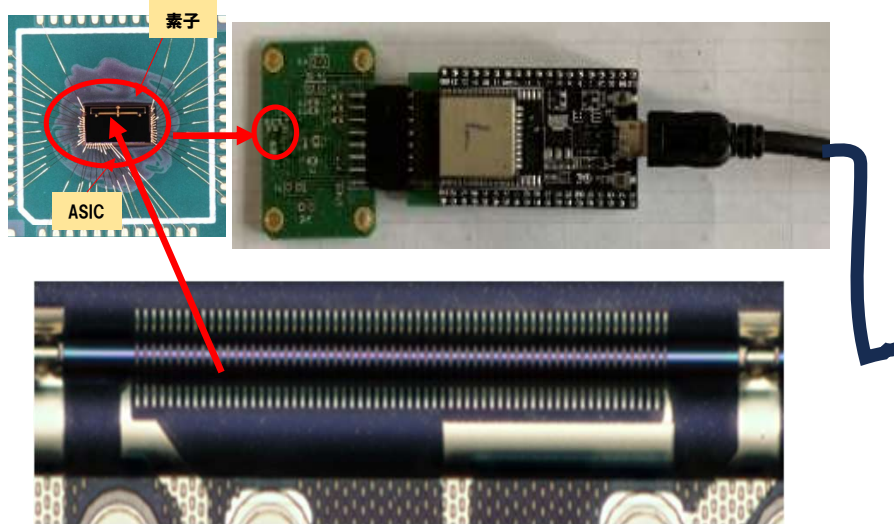


光永・水野・柴田

Main Products of MagneDesign

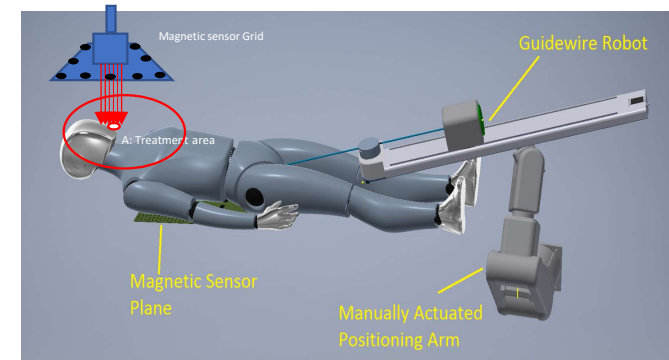
GSR sensor

detect 0.1nT with 2mm length element



GSR sensor applications

1) Catheter navigation robot

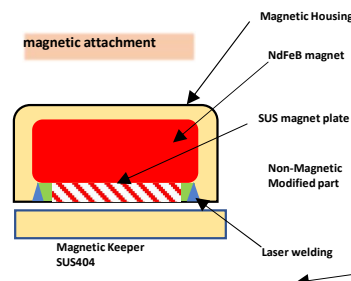
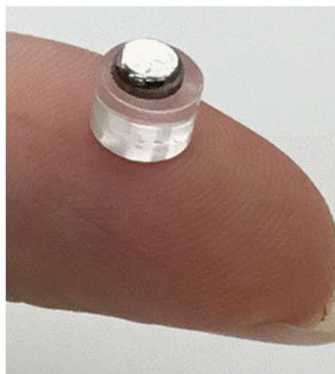


2) Implant treatment robot



Dental Magnet

MagTeeth 500/ 700/900



Partial denture	Overdenture
	

Recent development on Magnetic Dentistry

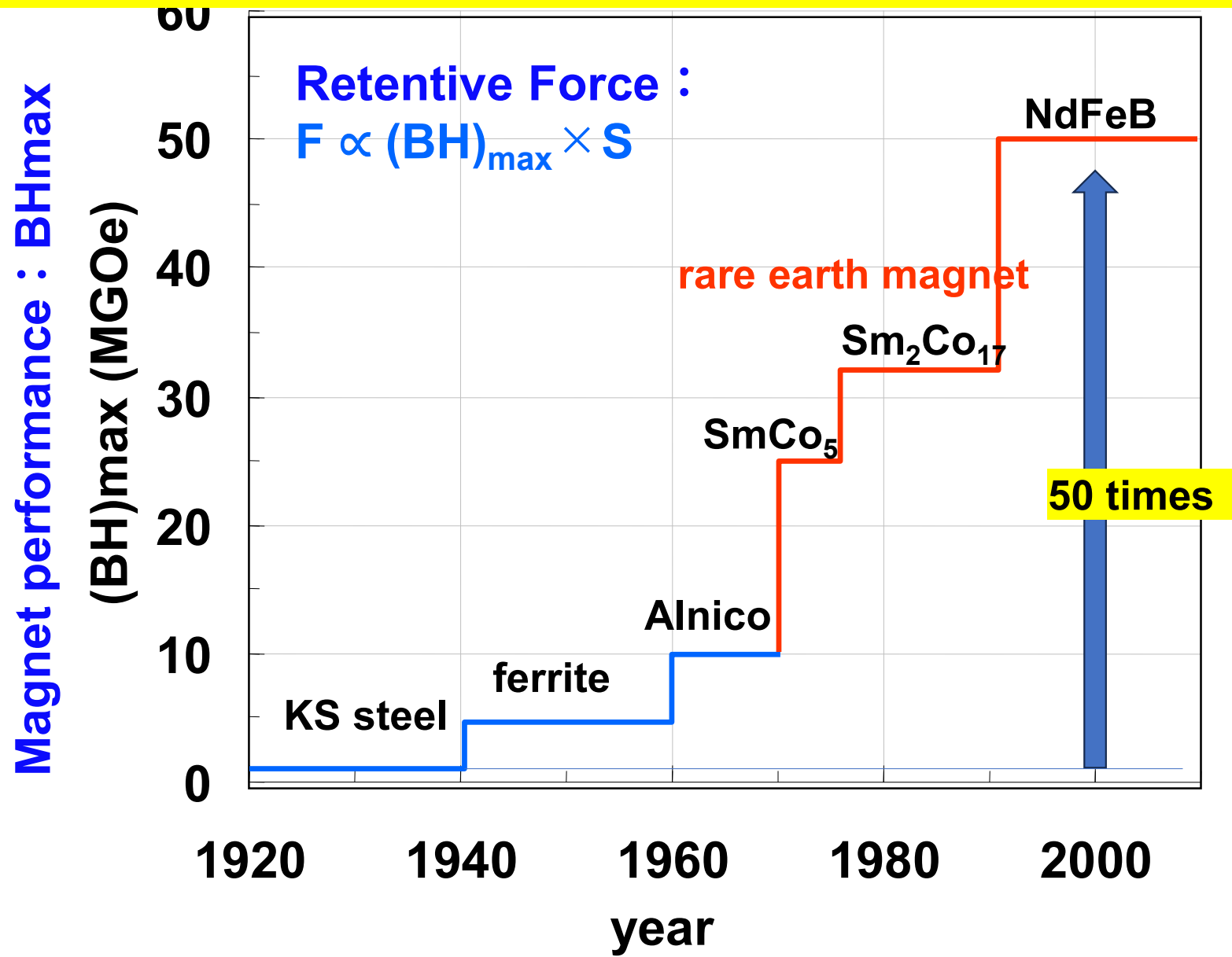
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Sep.5th.2025

Dr. Yoshinobu. Honkura
Magnedesign Corp.

Progress of Permanent Magnet from 1920 to 2025

In 1990, NdFeB magnet was invented which increases the magnetic performance BHmax by a factor of 50 times. The retentive force of magnetic attachments also increases proportionally to BH max



Retentive Force of AT increased by closed Magnetic circuit

Closed magnetic circuit can increase retentive power by 4 times compared to open magnetic circuit from 150gf to 600gf. Open Magnetic circuit is only magnet. Magnetic flux is extended. Closed Magnetic circuit is combined with Magnet and iron cap. Magnetic flux is contained in Iron and no leakage of magnetic flux to increase retentive force.

Open Magnetic circuit

Closed Magnetic circuit

150 gf

4 times up

600 gf

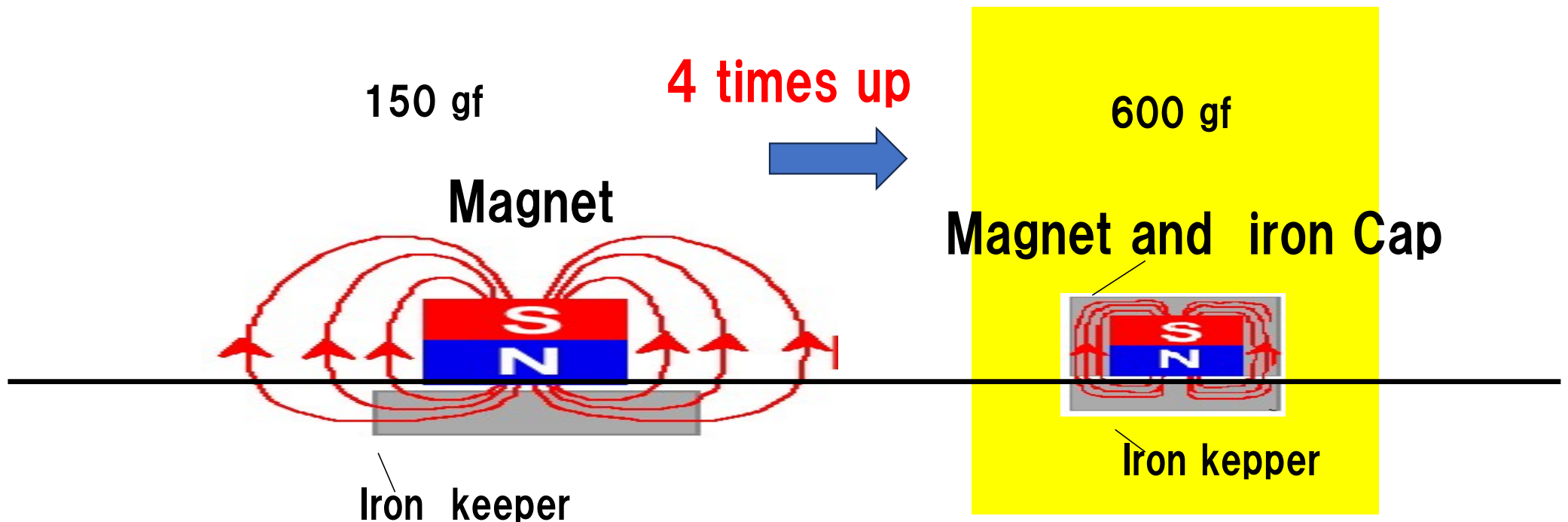
Magnet

Magnet and iron Cap

Iron keeper

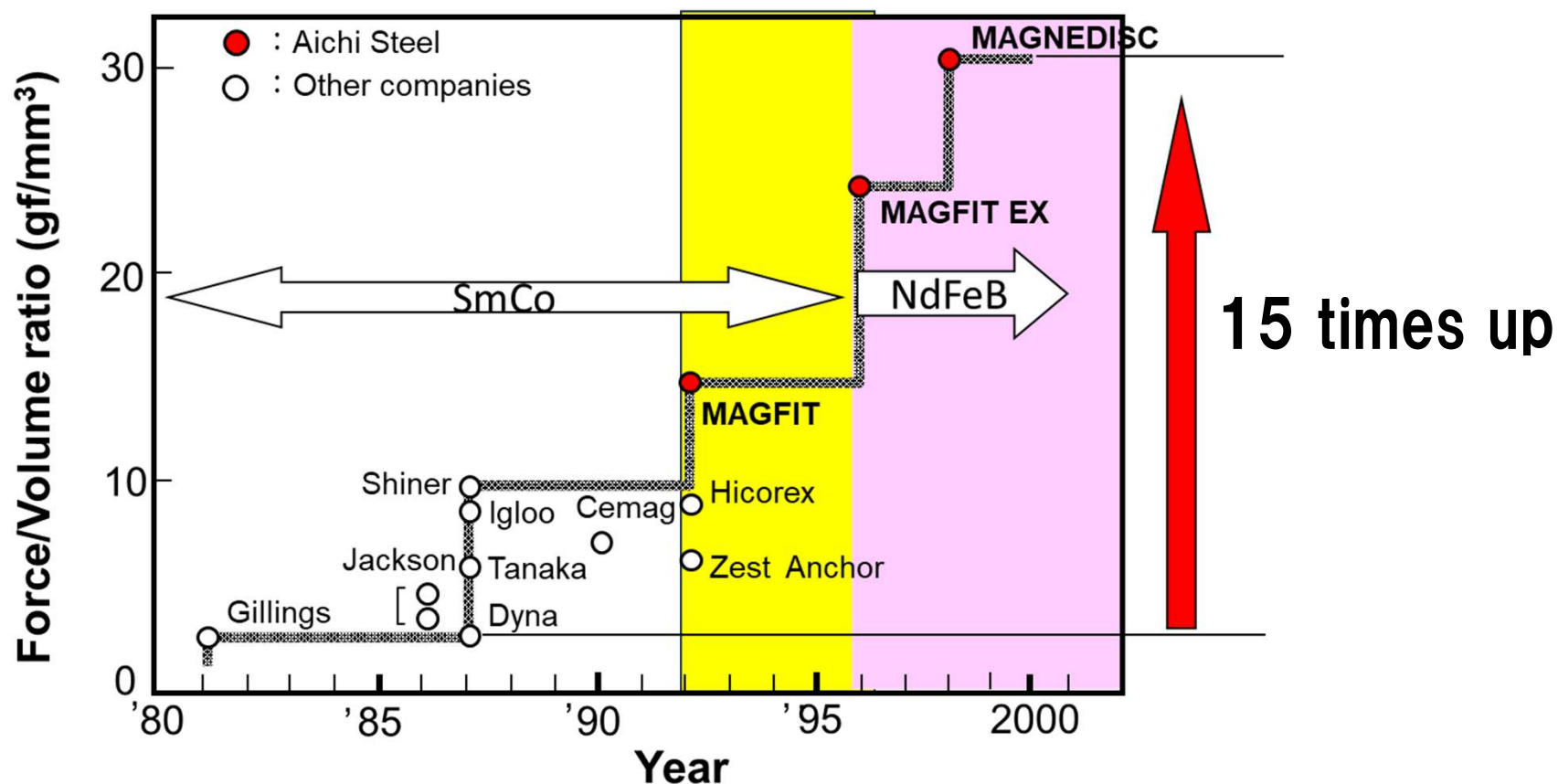
Iron keeper

size: diameter 4mm ϕ $\times$ height 1.5mm



Progress of magnetic attachment from 1980 up to 2005

In 1992, I developed a commercial product MAGFIT in Aichi-Steel using SmCo magnet by improving retentive force and solving the corrosion problem for the first time in the world. In 1996, I developed MAGFIT Ex and MAGNEDISC by NdFeB magnet. Dental magnetic attachments are now widely used as retentive devices for dentures.



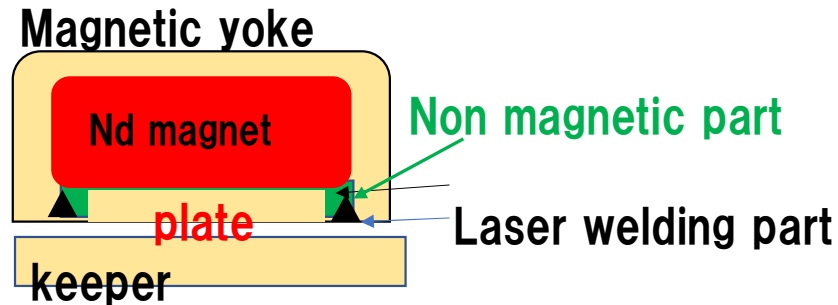
Dental Magnetic Attachment and Magnet Denture

Product



Diameter:4.0mm•
Hight:1.3mm
retension force:600g

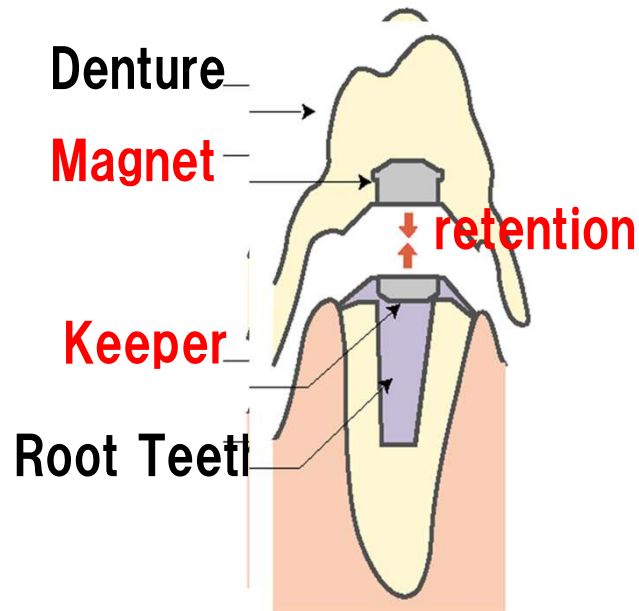
Inner Structure



Specifications

- small size
- strong retention
- no corrosion
- no magnetic leakage

Magnet Denture



Partial Denture



Over Denture



Advantages of magnet dentures

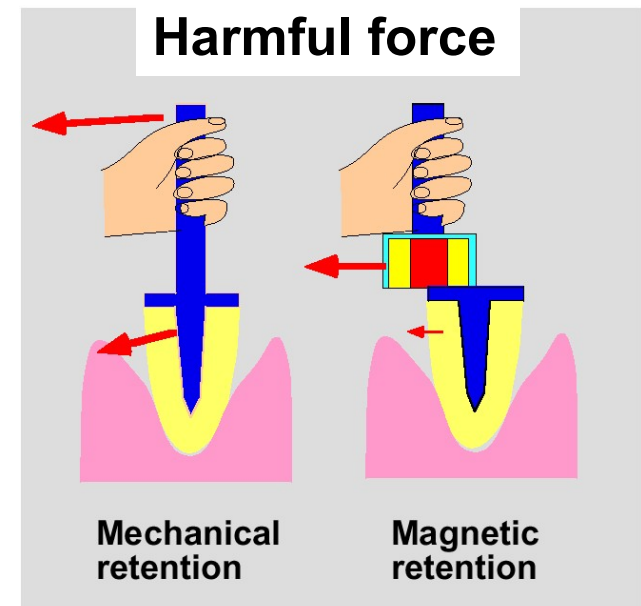
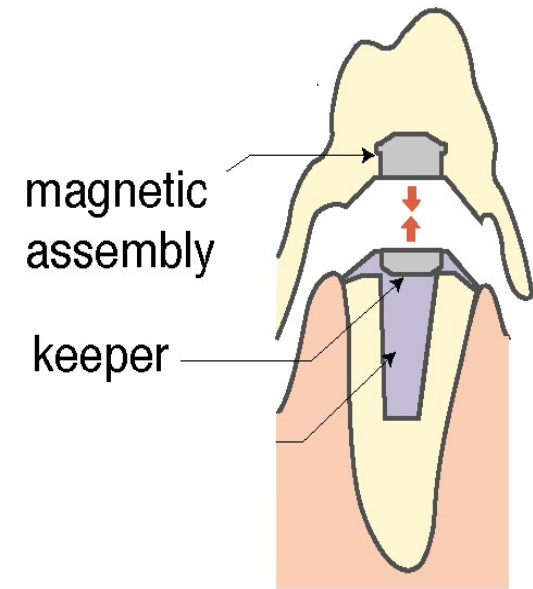
● advantages

- (1) **Permanent** retentive force
- (2) **Protect the tooth root from a harmful force with stress-breaking functions.**
- (3) Good esthetic.
- (4) Simple and easy denture design.
- (5) Easy on set up and remove on using dentures
- (6) Good at cleaning
- (7) Low price

Future price down from 100\$/piece to 30\$/piece

● Outstanding Issues in Clinical Application

- (1) Bad influence of magnetic field
⇒ solved by closed circuit
- (2) MRI diagnostic trouble
⇒ solved by removable keeper

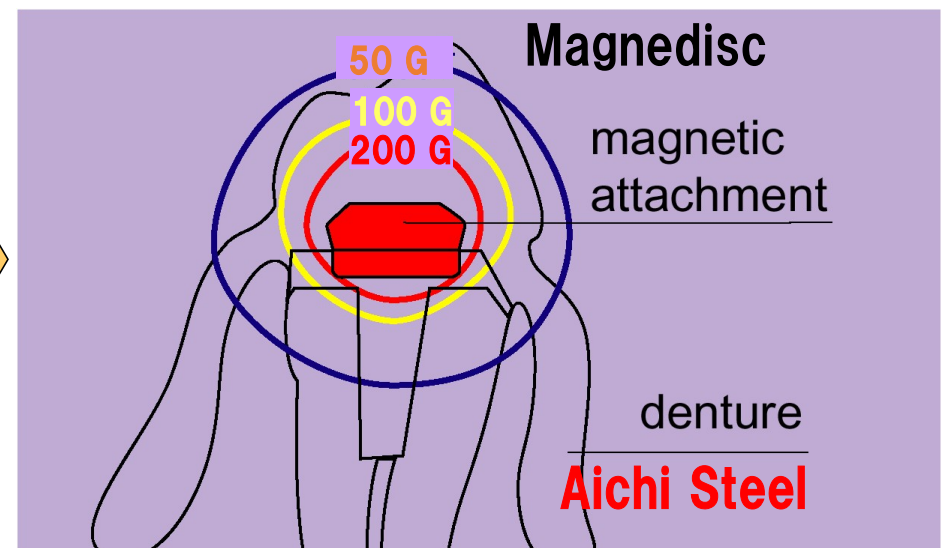
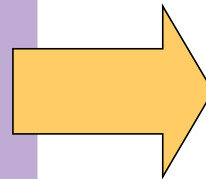
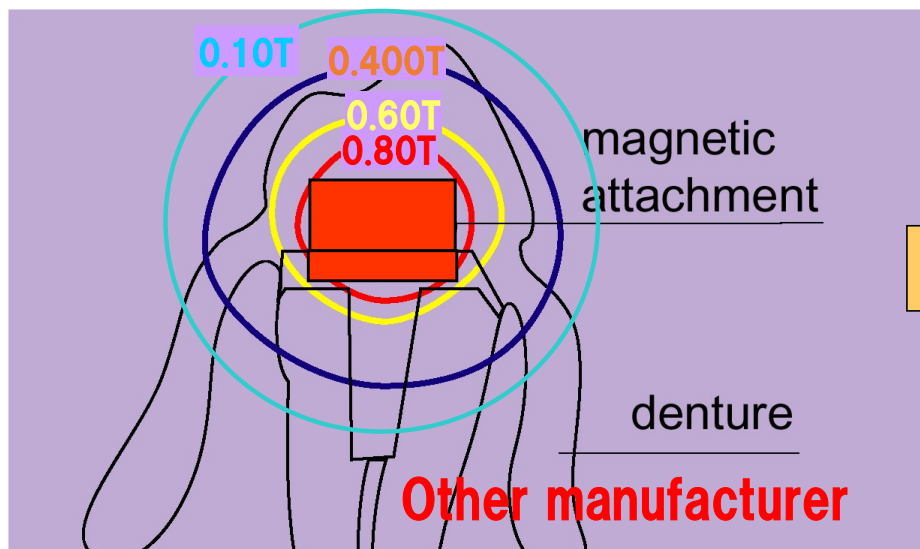


How to solve bad influence of leakage magnetic flux

At biggining The attachment used with a single magnet which made a large magnetic field of 4000G, but magnetic AT designed with closed magnetic circuit design has decreased to the magnetic field of less than 50G. 50G clears the safety standard of 200G or less.

Single Magnet
4,000 Gauss

Magnetic circuit Design
50 Gauss



U.S. Safety Standard: less than 200 Gauss

Recent development on Magnetic Dentistry

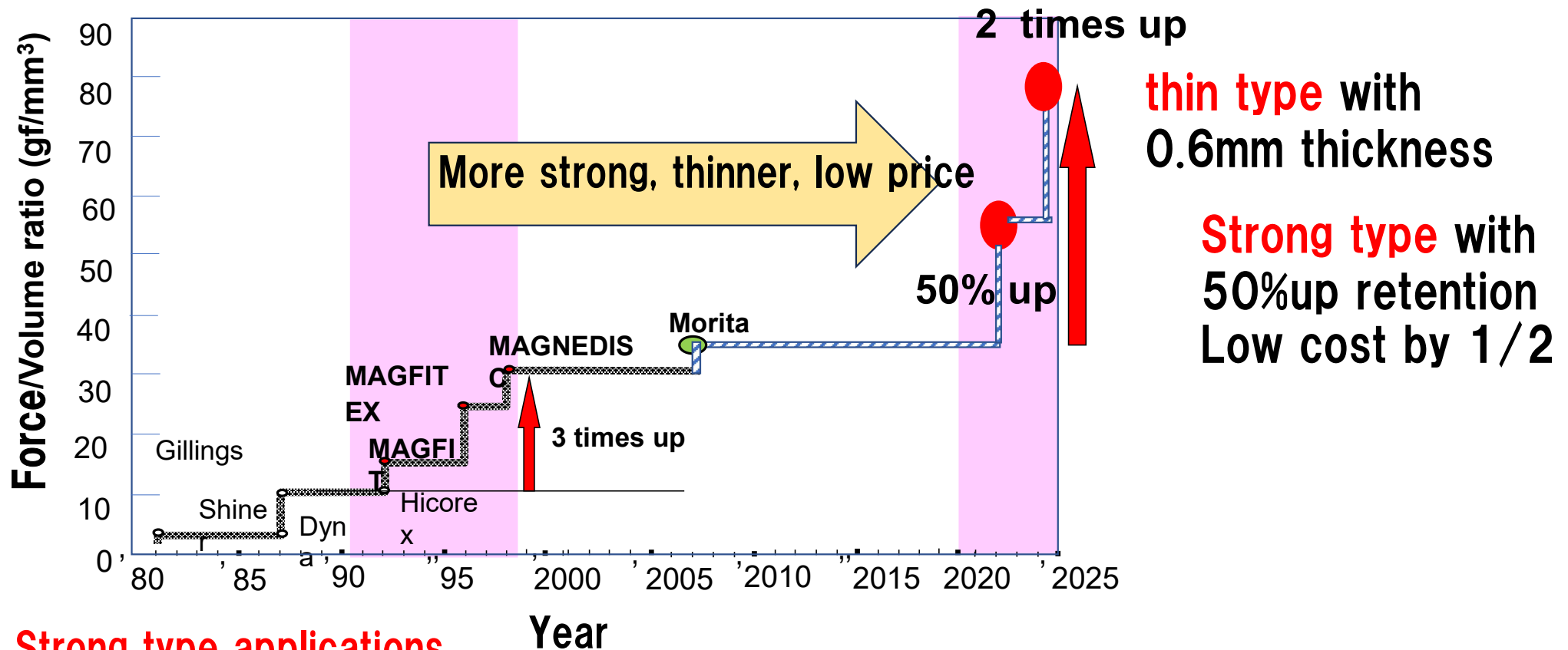
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Dr. Yoshinobu. Honkura
Magnedesign Corp.

Recent progress of AT used by Stainless Magnet

MDC developed new type AT used by stainless magnet to increase the retentive force by 2 times up. MDC developed strong type and thin type.



Strong type applications



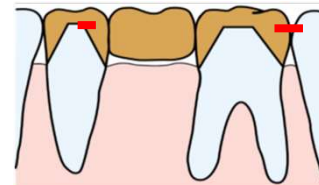
Partial denture

Overdenture



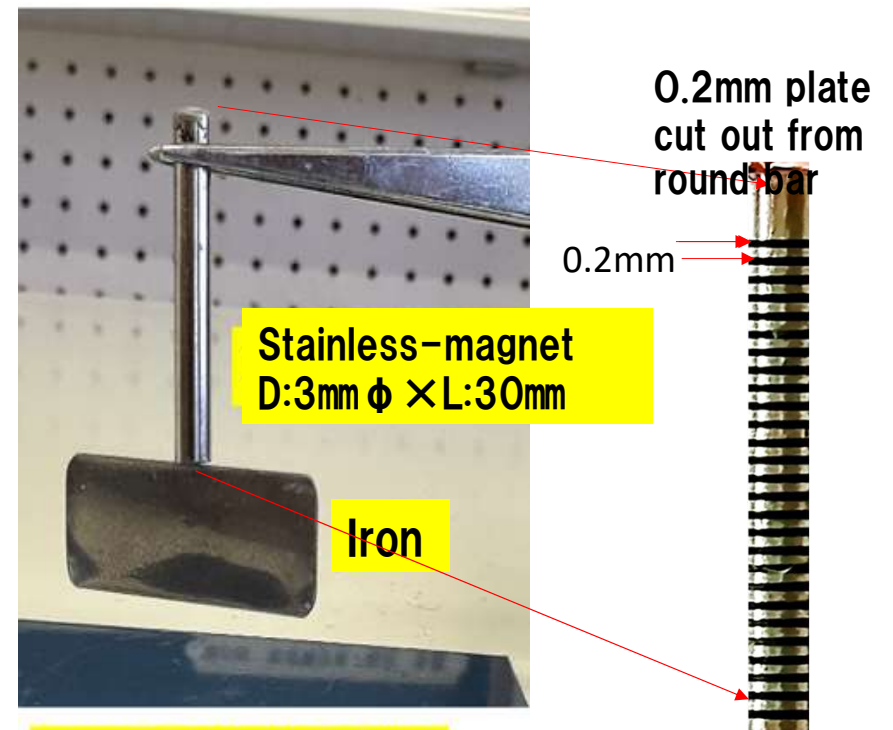
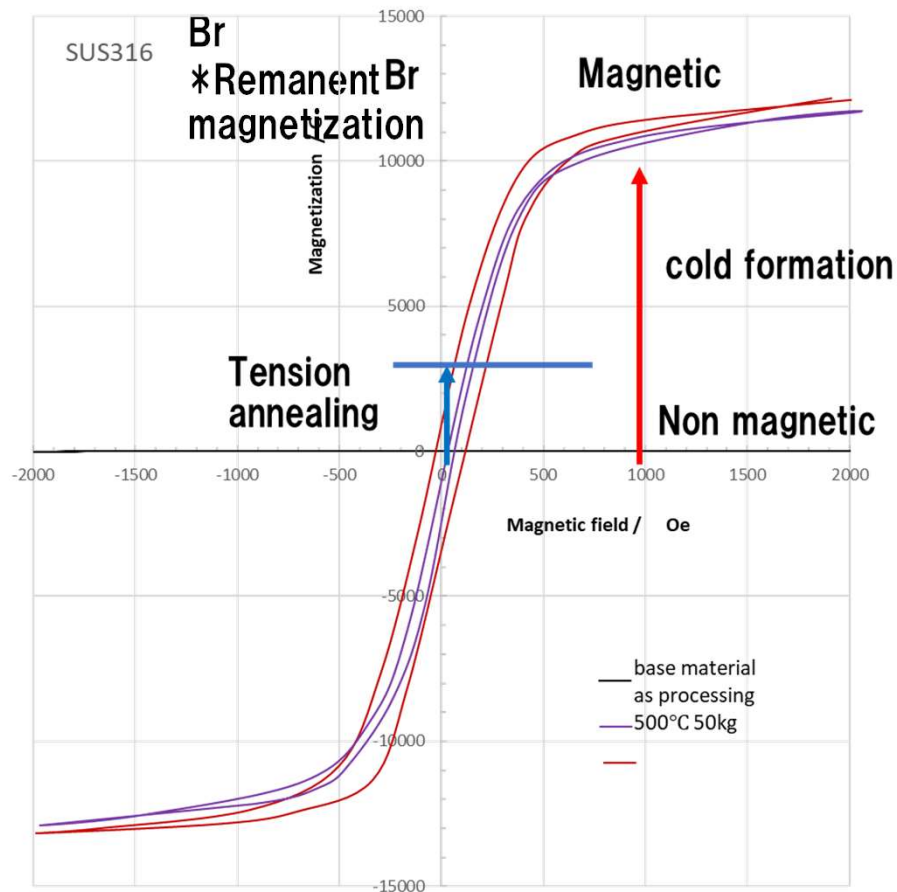
thin type applications

Removal Magnet Bridge



Invention of stainless magnet

I invented a stainless magnet in 2021 and got the patent
SUS316 stainless steel is **non magnetic**. When cold formed with 80% at -196°C , it changed to magnetic material. After tension annealing at 550°C with $10\text{kg}/\text{mm}^2$, it changed to magnet to increase Br:Remanet magnetization of 4000G.
Plate SUS magnet with 0.2mm is produced by cutting from round bar..

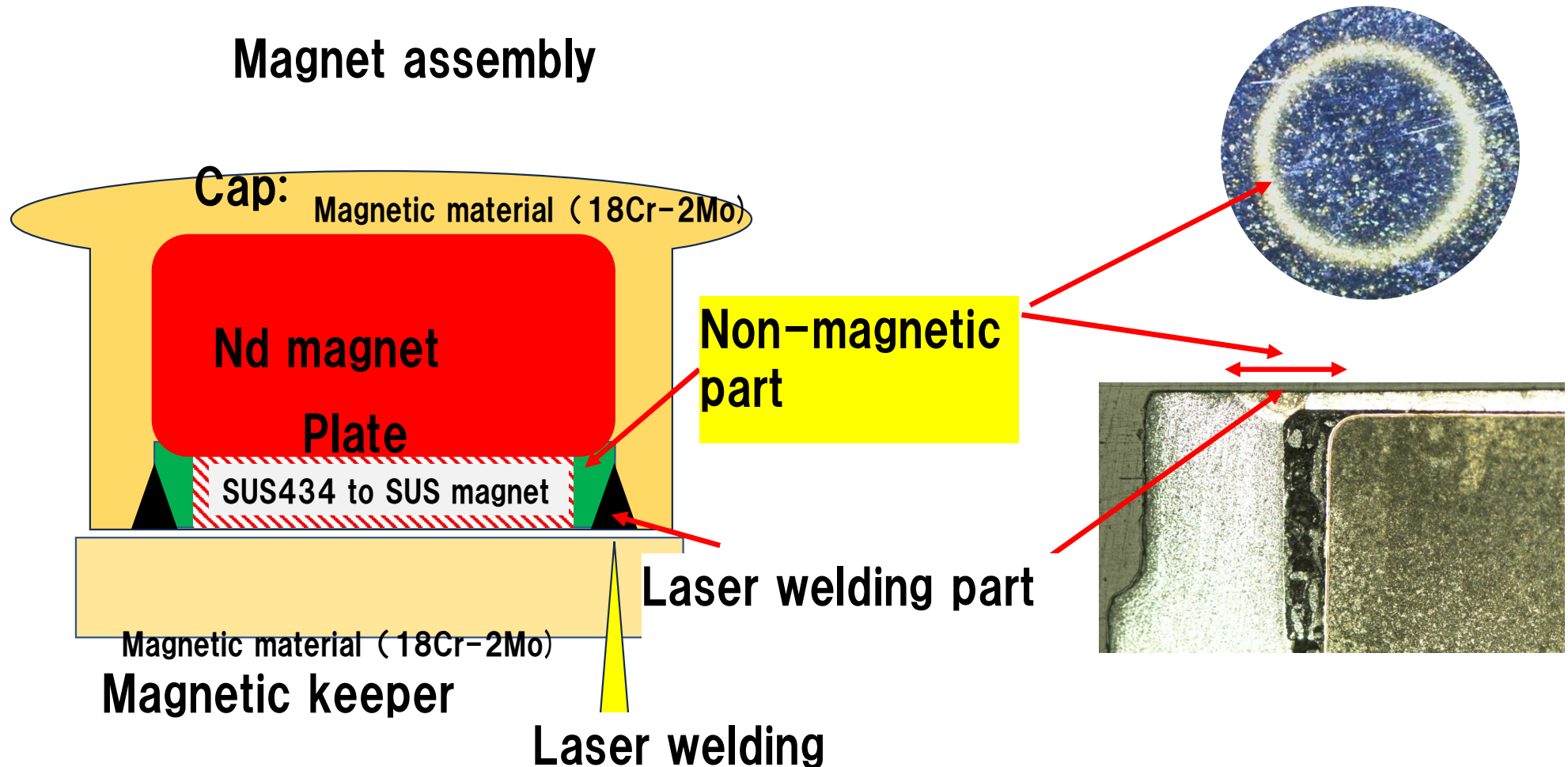


Iron is lifted up by a stainless magnet.

New design of magnetic AT using stainless magnet

The basic magnetic circuit design is same as conventional AT.
The plate uses magnetic material SUS 434. I changed it to SUS 316 stainless magnet.
laser welding part with plate and Cap is changed to non magnetic part.
The retention power increase by combined power with Nd magnet and stainless magnet.

Magnet assembly



Retentive force of Strong type AT by SUS magnet

Retentive force of strong type MagTeeth increases **from 600g to 900g**.

The reason is when the SUS magnet is used, the strength of the magnetic field in the center of the retentive surface is increased up from conventional type. We believe this is the cause of the increased retentive force. In addition, the non magnetic boundary between the SUS magnet and the iron cap contributes to increase retention.

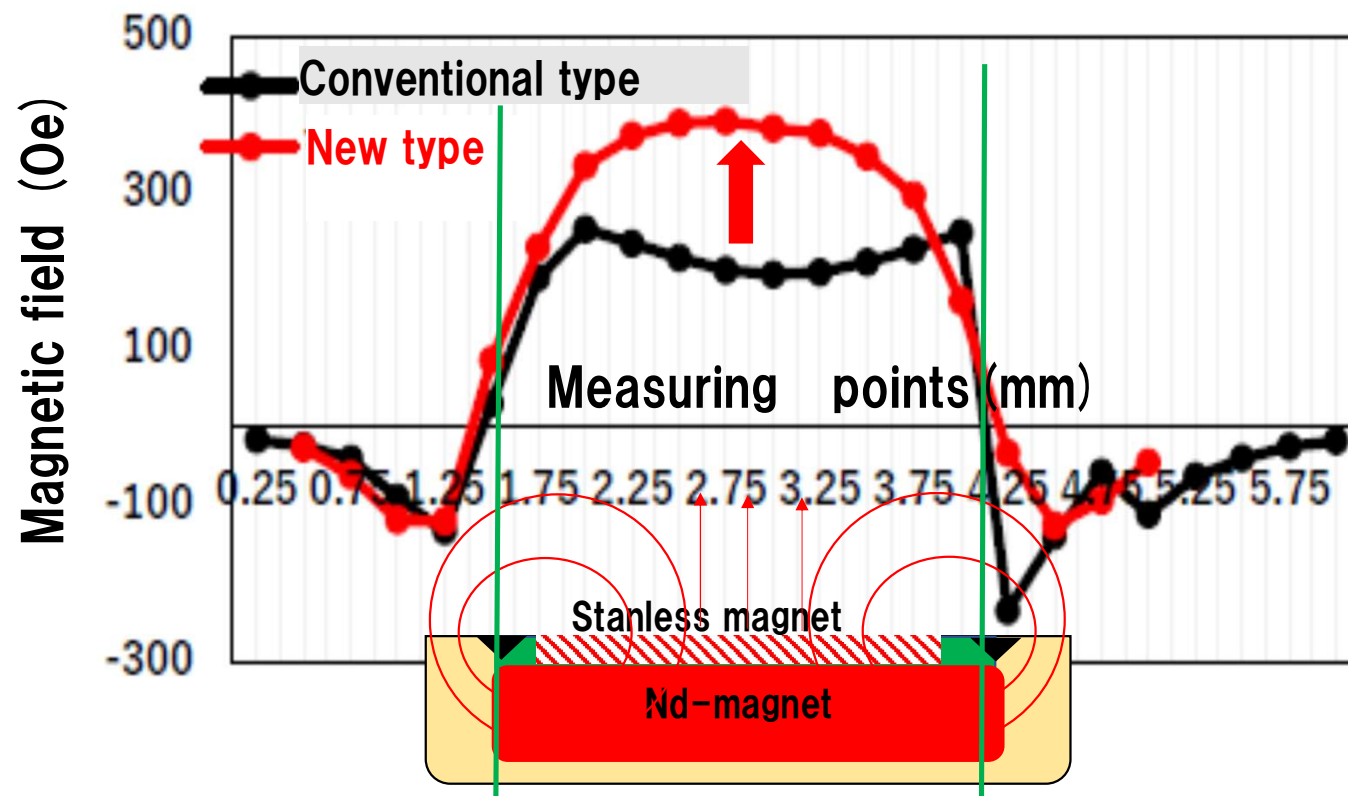


Fig.2 Magnetic field distribution on attachment magnet surface

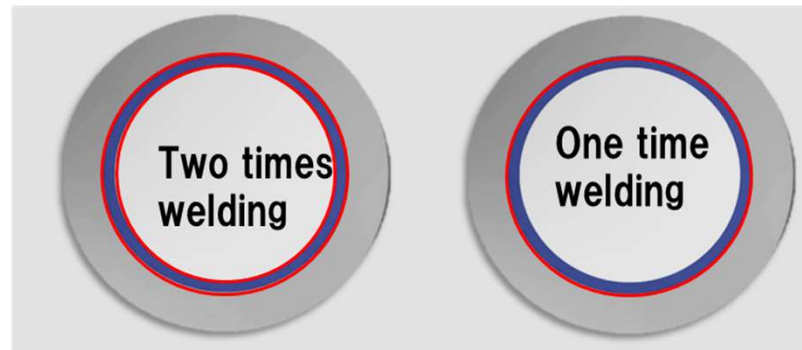
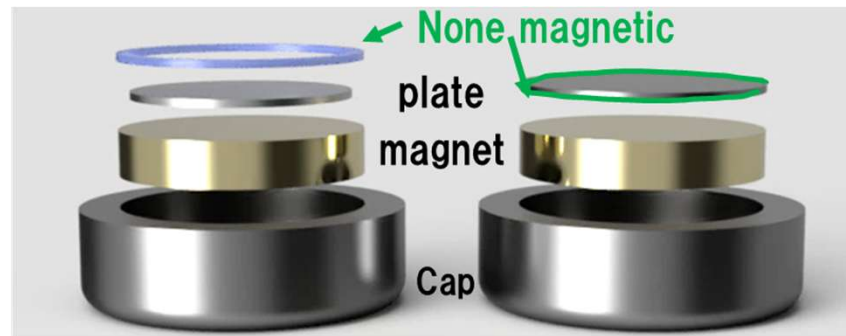
New technique can reduce AT cost drastically

The conventional type consists of precise 4 parts produced by machining, very expensive. New technique type consists of rough accuracy 3 parts produced by press. very cheap about 1/10. The assemble cost of 4 parts welded by two times welding is expensive. That of 3 parts welded by **one time without non-magnetic ring** is low cost. As a result, manufacturing costs can be reduced drastically about by 1/5. Moreover, the structure is simpler and the quality is more stable.

Conventional type

4 parts by machining
Expensive
Difficult in assembling

2 times of welding
with nonmagnetic ring



New technique

3 parts by press
⇒ 1/10 cheaper
easy in assembling

one times of welding
To produce
non magnetic part

Production Process for new designed magnetic AT

There are three parts: Nd magnet, cap, and SUS magnet plate.
The assemble process are assembly, laser welding, grinding of the weld surface, engraving of identification numbers, and finally magnetization.

parts		Assemble process																
構成部品		Assemble	welding	grinding	engraving	Magnetize	inspection											
SUS magnet plate		 cap 14 う抜き 	 特徴： 定位置圧入方式	 特徴： 溶接深さ、幅制御	 特徴： 切り込み1μ制御	 製造年、月、日 ロットNo 特徴： 12桁微小刻印	 特徴： 高磁場	<table><tr><th>タイプ</th><th>磁力</th></tr><tr><td>4.5 φ</td><td>250mT</td></tr><tr><td>4.0 φ</td><td>220mT</td></tr><tr><td>3.6 φ</td><td>190mT</td></tr><tr><td>3.0 φ</td><td>142mT</td></tr></table> 特徴： 微小磁界測定	タイプ	磁力	4.5 φ	250mT	4.0 φ	220mT	3.6 φ	190mT	3.0 φ	142mT
タイプ	磁力																	
4.5 φ	250mT																	
4.0 φ	220mT																	
3.6 φ	190mT																	
3.0 φ	142mT																	
Nd magnet プレス成形  磁石：希土類		 圧入プレス	 レーザー溶接装置	 研磨装置	 レーザーマーカ装置	 着磁電源-コイル	 磁力検査装置											

Solution for detach trouble of Magnetic Attachment

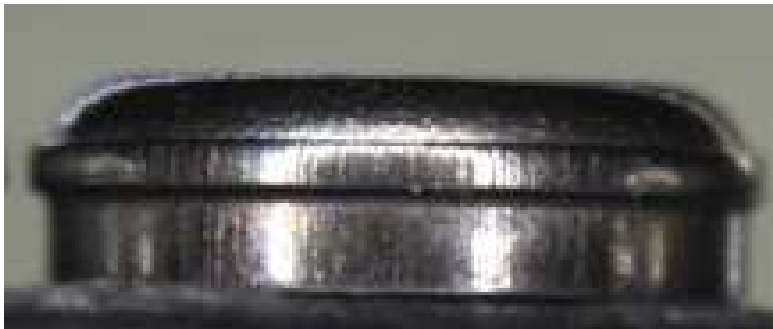
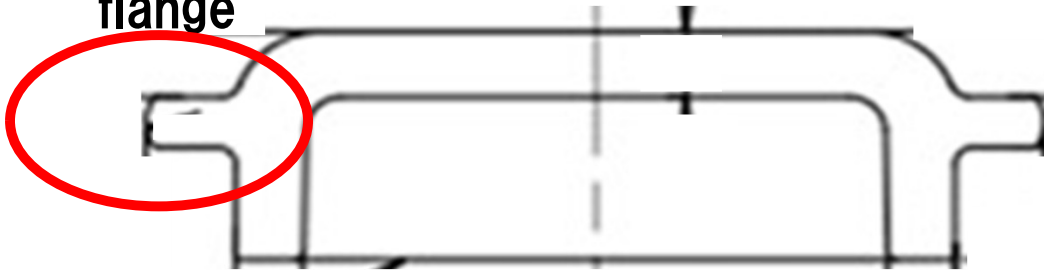
The solution consists of two actions.

One is to put flange on side face of AT. Shown in this photo.

Second action is to make rough surface of side surface by shotblast and metal adhesives resin coating .

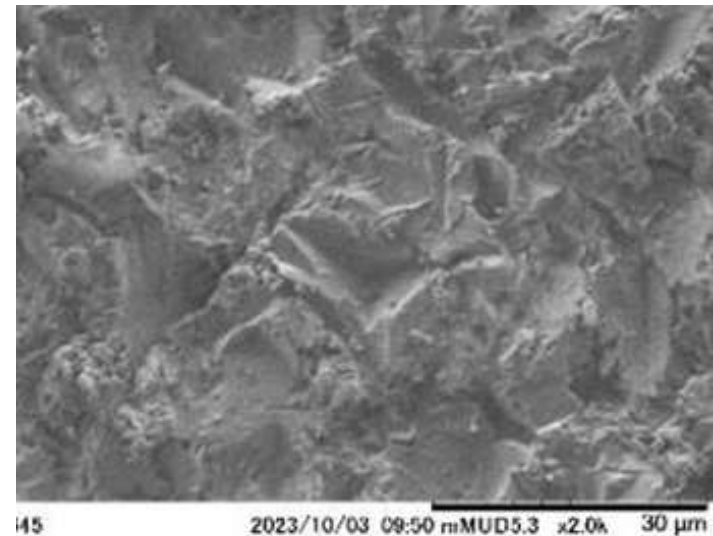
1) Develop magnetic attachment with flange

flange



magnetic attachment with flange

2) Surface treatment combined with shotblast and metal adhesives resin coating



Surface treatment by shotblast

Products of MagTeeth900/700/500

Product name	MT900	MT700	MT500
shape			
diameter4.0mm hight1.3mm	D:4.0mm H:1.3mm	D:3.6 mm H:1.2 mm	D:3. mm H:1.1 mm
Retentive force	900±50gf	700±50gf	500±50gf

**Cast
Keeper**



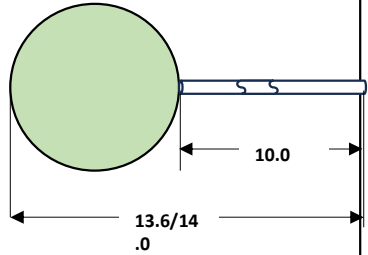
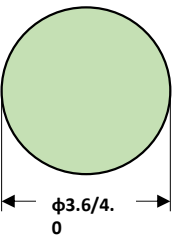
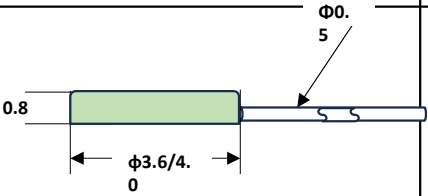
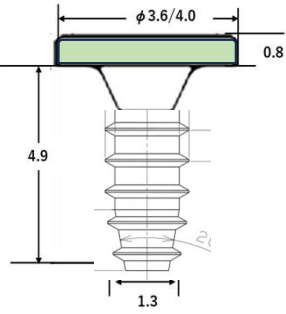
**Root
keeper**



MagTeeth Package

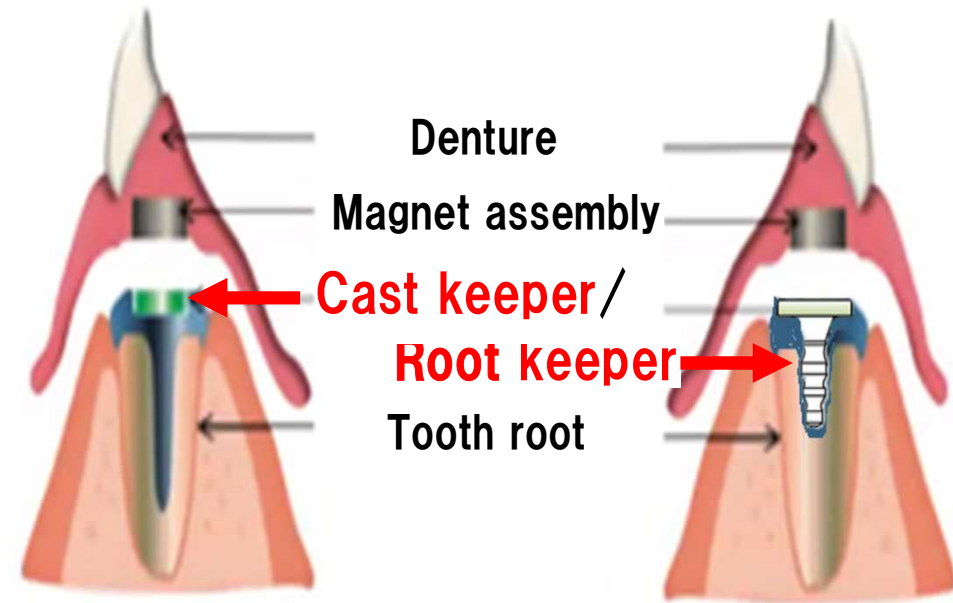


Keepers produced by press process

Cast Keeper	Root Keeper
	
	

Cast keeper/

Root keeper



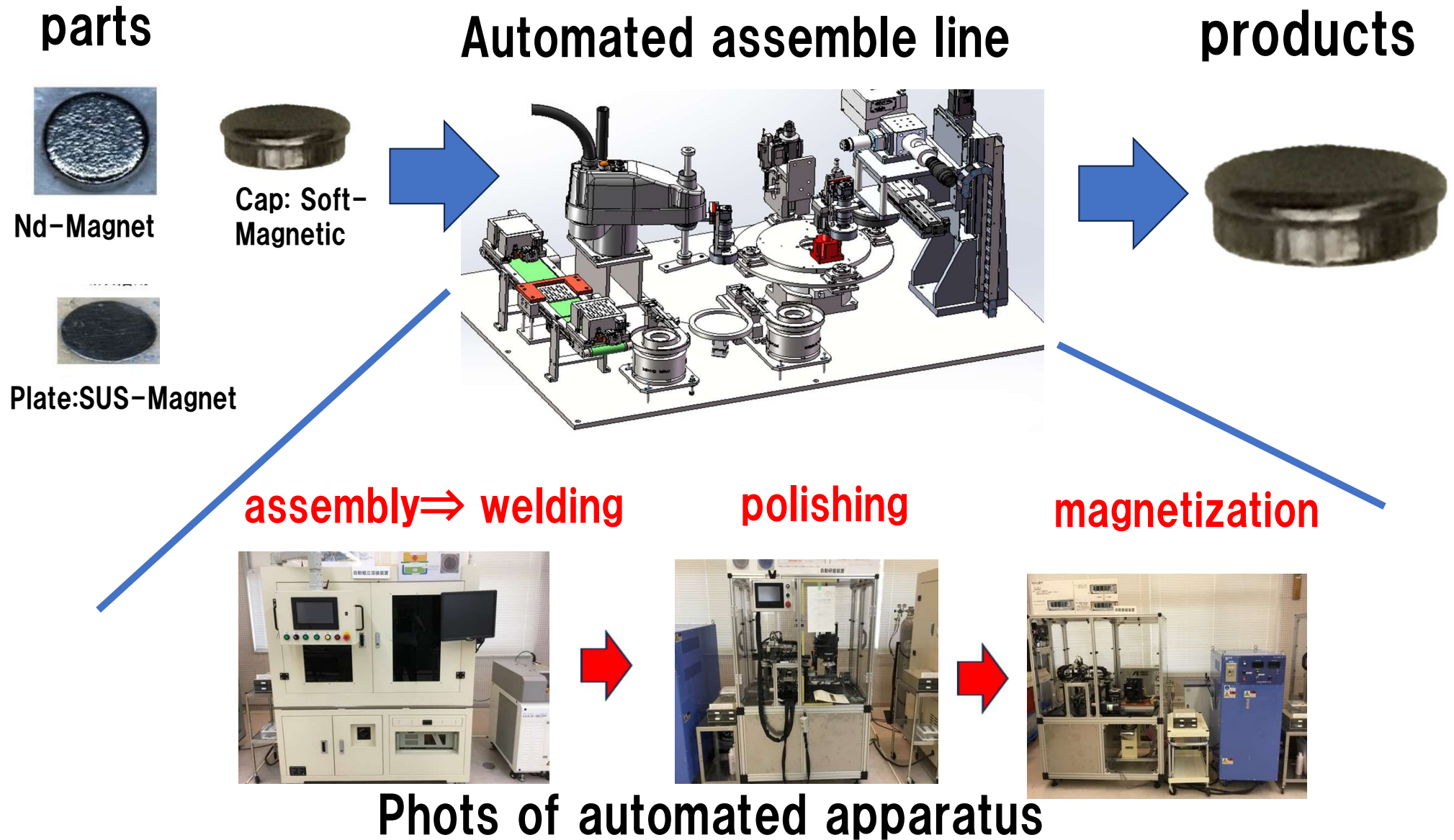
Metal Coping

Regin Coping



One automated production line is established with capacity of **20K/M**

The line consist of assembly line, polishing line and magnetizing equipment.



Recent development on Magnetic Dentistry

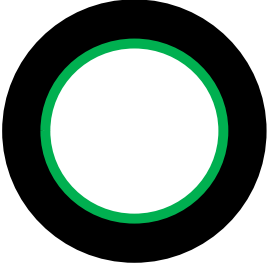
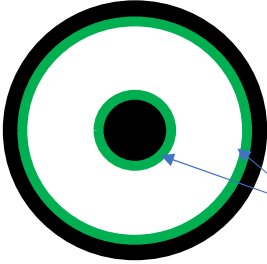
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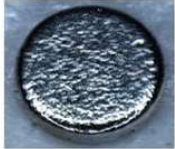
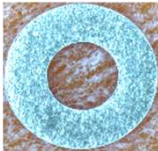
Development of a thin type MTS700 with 0.6mm height

This table shows comparison with strong type and thin type with same diameter of 4mm

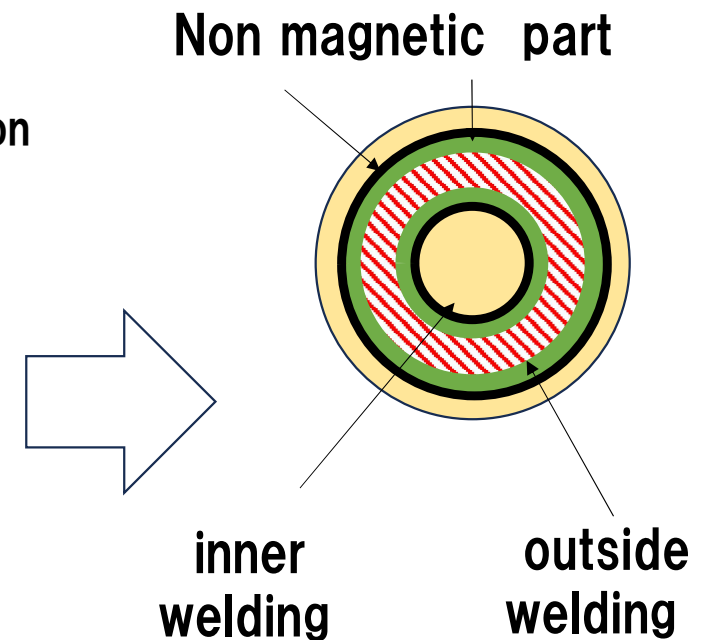
	MT900 strong type	MTS700 Thin type
structure	Round shape	Ring shape
size	D=4mm、t=1.3mm 	D=4mm t=0.6mm 
Horizontal section	 one Laser welding	 two Laser weldings
Cross section	 plate	 With projection
Keeper height	height 0.8mm	height 0.2mm ~ 0.4mm
Total height	height 2.1 mm	height 0.8mm ~ 1.0 mm (40%~48% reduction)
Attractive Force	900gf	720 gf (20% reduction)

Production is almost same with strong type and thin type.

Three parts produced by press process are same but different in shape

parts	Strong type	Thin type
cap		
Nd magnet		
SUS magnet plate		

laser welding with two times



Laser welded part

Production process for SUS magnet plate

Cold formed SUS round bar



Wire cut to thick ness of 0.2mm

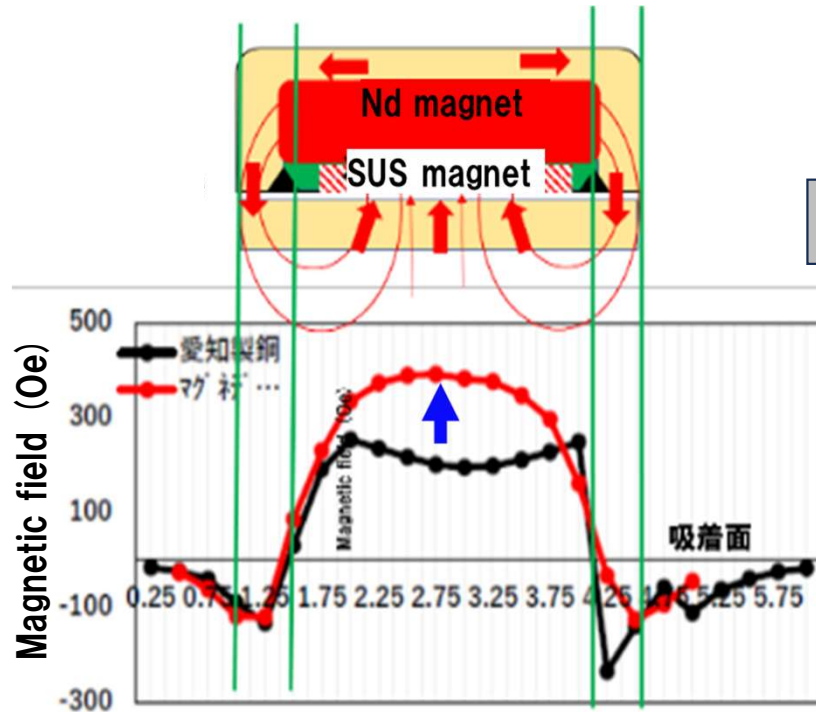


Polishing to thick ness of 0.1mm



Principle to Increase the attractive force by a thin type AT

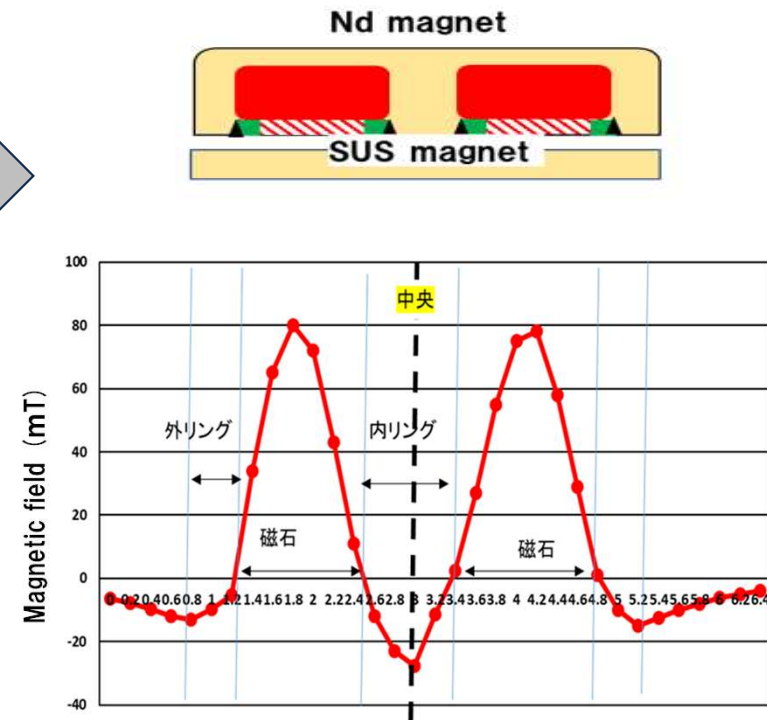
strong type



Strong type shows one peak of magnetic field distribution .

D:4.0mm H:1.2mm
Attractive Force : 900gf

Thin type

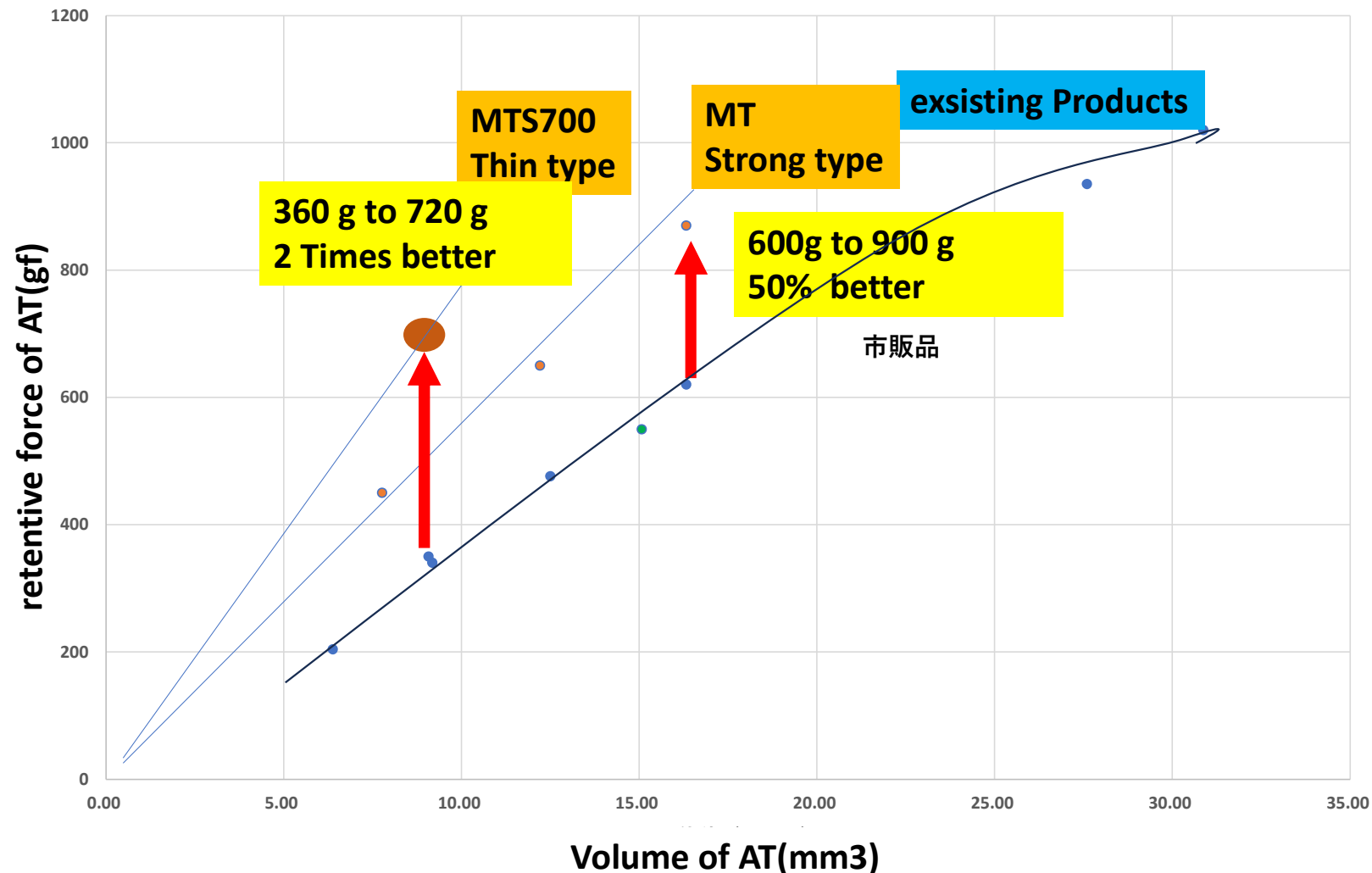


Thin type shows dual-peak of magnetic field distribution.
⇒ make the 2 time up retentive force even half the thickness

D:4.0mm H:0.6mm
Attractive Force : 720 gf

Comparison in the attractive force of Magnetic attachments

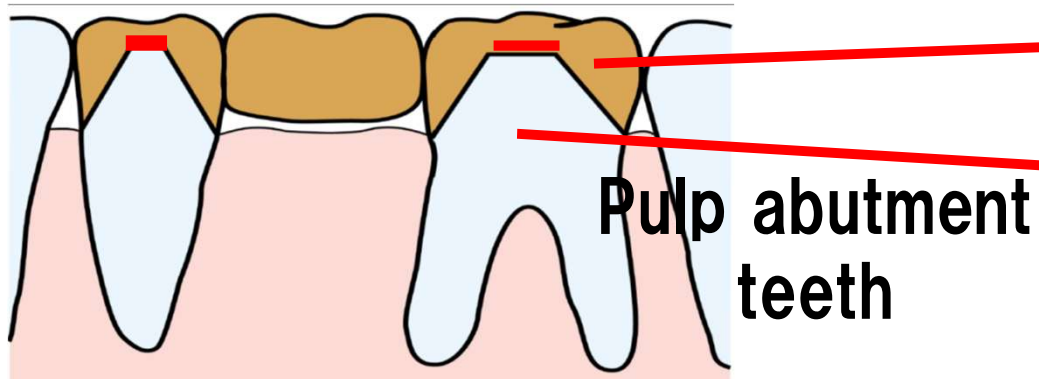
This figure shows the relationship between AT volume and retentive force. Comparing retentive force with existing AT at the same volume, the strong type shows a 1.5-fold increase, and the thin magnetic attachment shows a 2-fold increase.



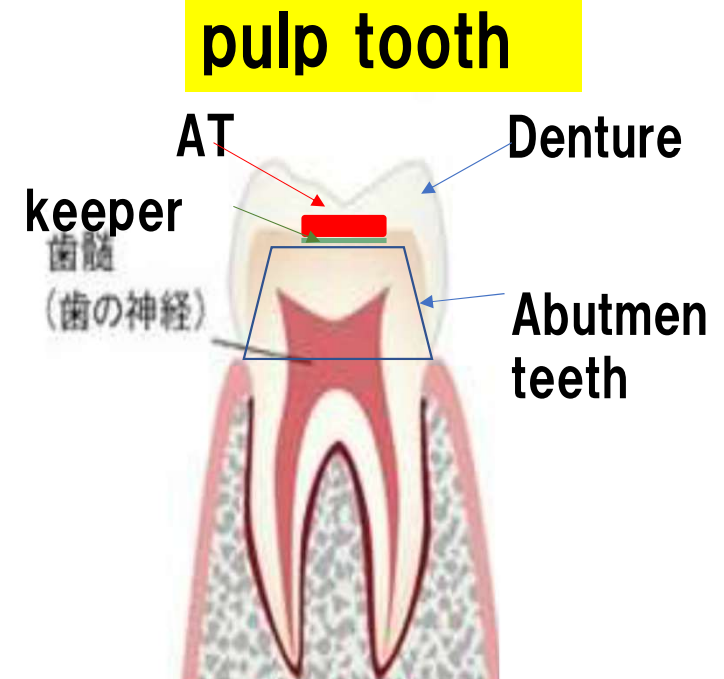
Application: Removable bridge using a thin type AT

This photo shows model of removable bridge using thin type magnetic attachment.

Removal Magnet Bridge

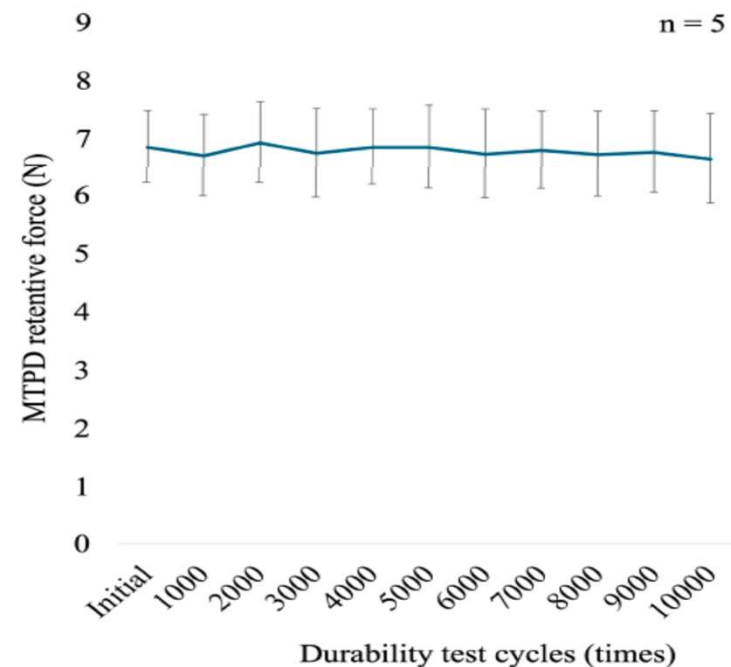
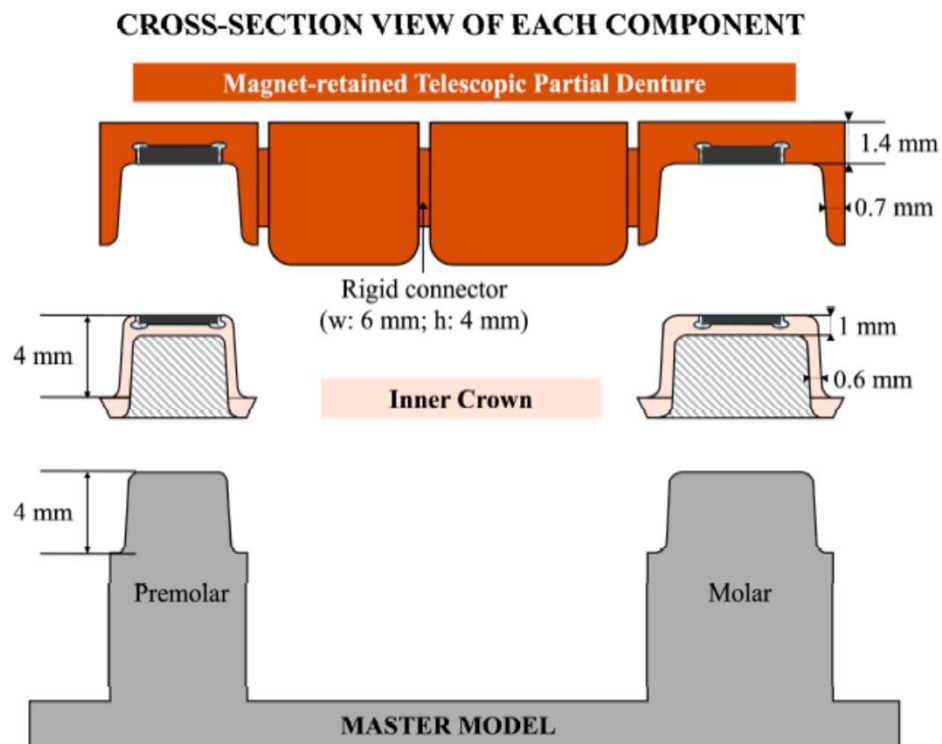


The recent trend in denture treatment in Japan is expected to increase bridges instead of dentures. This is the result of the 8020 movement which aims to remain 20 healthy teeth at the age of 80. I expect to increase removal magnet bridges, which need thin type AT



Contemporary Magnetic Removable Partial Denture Utilizing a Novel Ultra-Thin Magnetic Attachment System

The research were published in the Dentistry journal. Using this model, a fatigue test involving 100,000 cycles with 100N was performed to observe changes in the magnetic force. The results showed no change in the retention force of the thin magnetic attachments. This demonstrated that they possess sufficient durability despite their thinness, .



MDC New Technology in the World's Strongest Dental Magnet Development

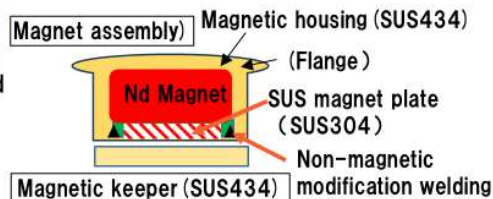
MagTeeth® 900/700/500

New Technology

- Combined stainless magnet and Nd magnet to increase attractive force by 50%.
- Simplified the progress of non-magnetic modification and welding.
- Manufactured all parts with press mold using precision assembly technology.

Principle of increase in Attractive Force

MagTeeth is the world's first magnet that combined with SUS magnet and Nd magnet. The circuit formed by the magnet, keeper and magnetic housing improved force by 50% (Patent NO.○○○)



Features (Specification)

- 1) Superior attractive force.
- 2) World's first Non-magnetic modification welding technology for welding reinforcement.
- 3) Use of corrosion resistance material such as SUS304 and SUS434.
- 4) Flange and metal glue for anti-detachment.
- 5) Press-formed parts contributed to reduction of manufacturing cost.

Product Code	MT900	MT700	MT500	Casting Keeper	Root Keeper
Photo					
Dimension	Diameter 4.0mm 	Diameter 3.6mm 	Diameter 3.0mm 		
Attractive Force	900±50gf	700±50gf	500±50gf	—	—

Developed Thin Magnetic Attachments available for Pulp-Preserved Teeth

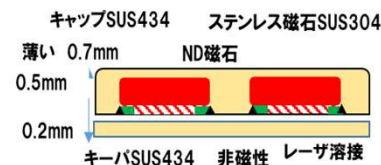
MDC MagTeeth™—S700

(特許出願中)

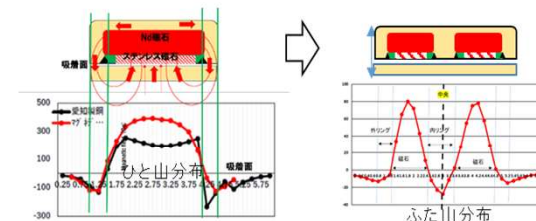
Characteristics

- Stainless steel magnet and ring structure achieves 700g holding force at 0.6mm thickness
- Non-magnetic modification on laser welding technology ensure superior quality
- Excellent corrosion resistance: Premium stainless steel with reliable laser welded joints

Structure



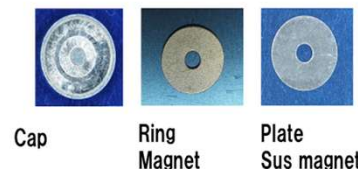
Principle to increase the attractive force



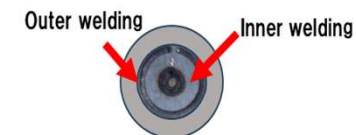
- 3 times improved attractive force is achieved through stainless magnets and ring-shaped Nd magnets
- Developed a thin ring structure, incorporating stainless steel magnets into the plate

Specification's

品番	MTS700
Magnet assembly	市販品 薄型 Diameter 4mm Height 0.6mm
Keeper	Diameter 4mm Height 0.2 ~ 0.4mm
吸引力	700±50gf



Non magnetic modification welding



Clinical Application

This is the catalog for MagTeeth strong type and thin types. They are available in Indonesia through PAM Corporation, so please feel free to use them.

force as well as lowered the price to make dentures more affordable.



Dental pulp



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https://www.magnedesign.jp Tel: (0569) 47-7631

Recent development on Magnetic Dentistry

- 1) Introduce of Magnedesign corp.
- 2) Background of dental magnetic attachments
- 3) Development of strong type dental magnetic attachment
- 4) Development of thin type dental magnetic attachment
- 5) **MRI keeper**
- 6) Summary

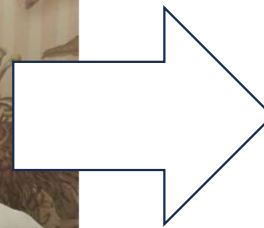
Sep.5th.2025

Dr. Yoshinobu. Honkura
Magnedesign Corp.

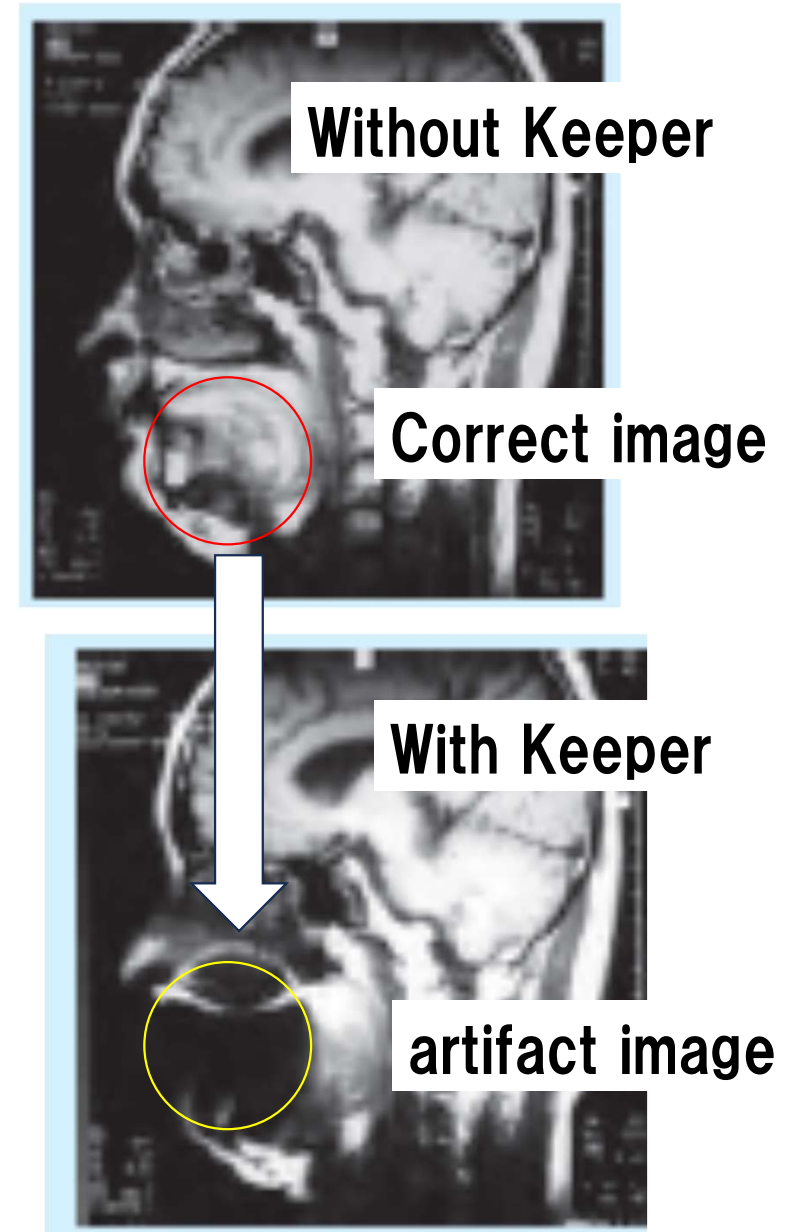
MRI diagnostic trouble and solutions

MRI diagnostics are widely used. When patients wearing a Keeper undergo MRI diagnostics, significant artifacts occur, making accurate examinations impossible.

MRI diagnostic device

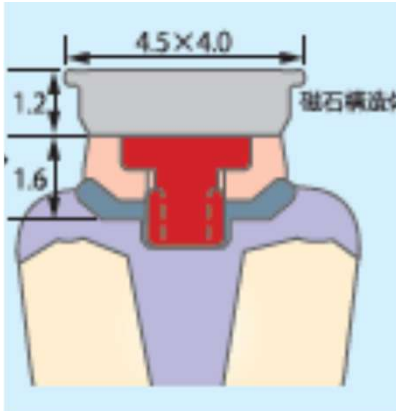


MRI image

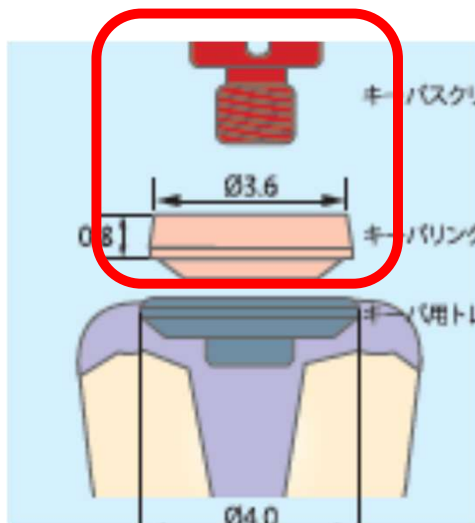


Traditional method to solve MRI Trouble

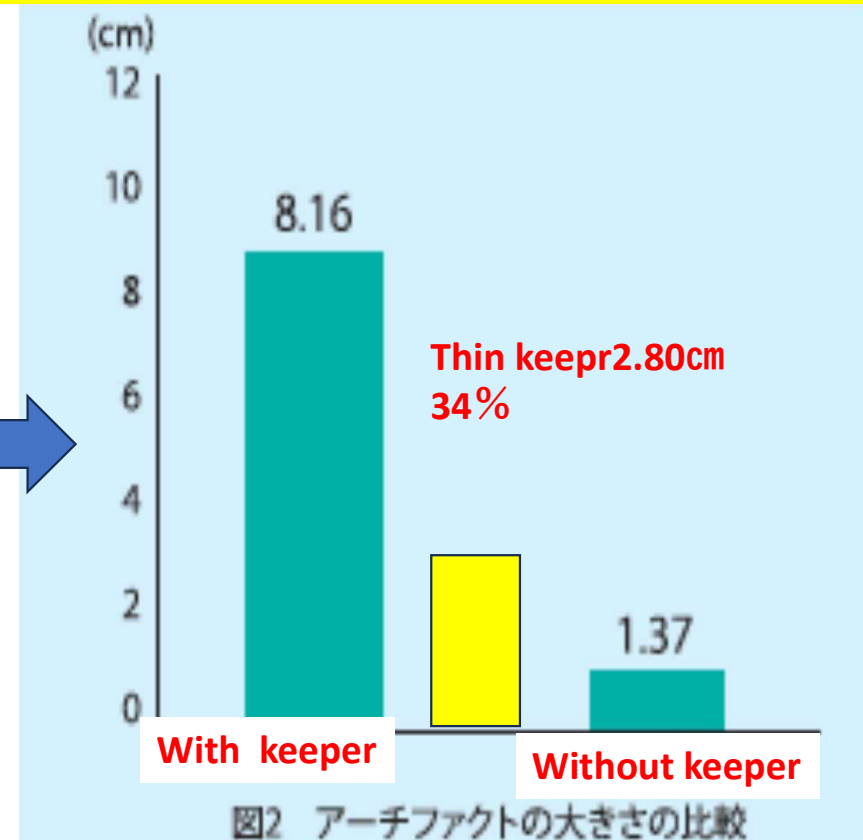
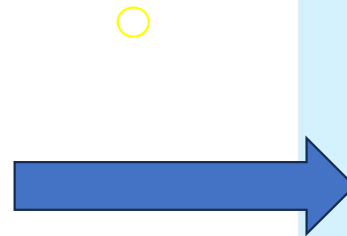
Usually In use
keeper is set



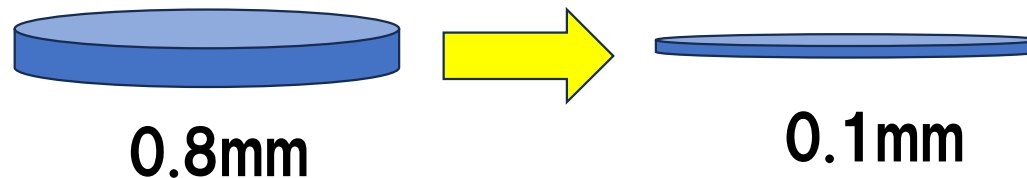
In MRI observation
Keeper is removed by screw



MRI artifact are reduced from 80mm to 14mm

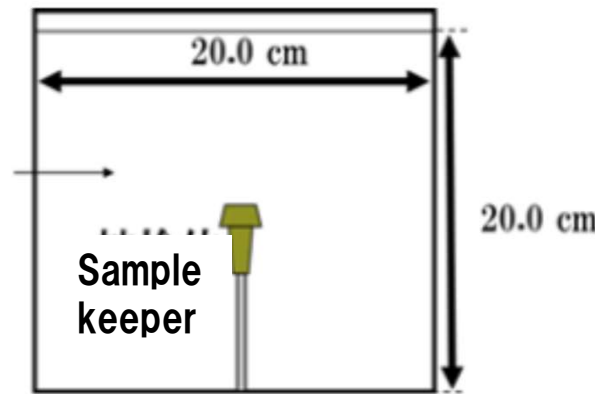
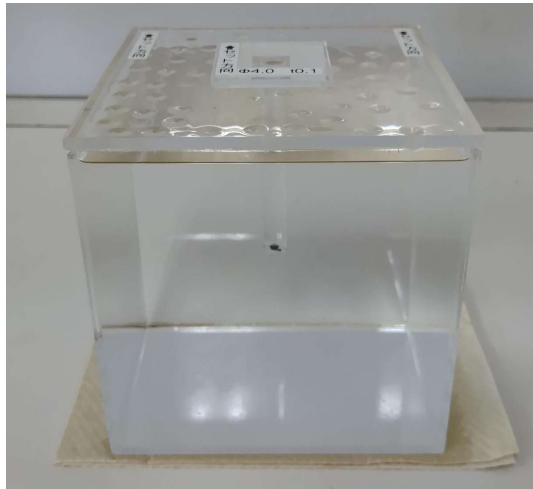


The structure of MRI keeper is complicated/expensive
New idea: Keeper thickness reduces from 0.8mm to 0.1mm



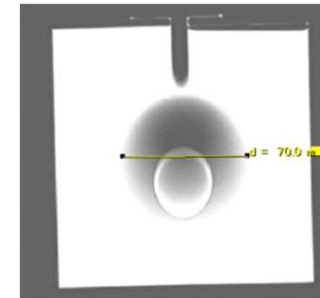
Effects of keeper thickness on MRI artifact diameter

Phantom for measuring image artifact on MRI



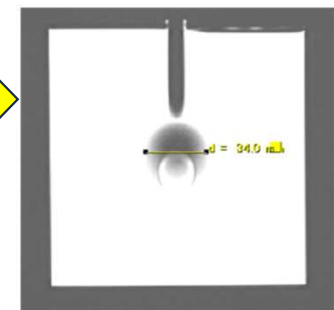
D4mm T:0.8 mm

artifact diameter :
70mm

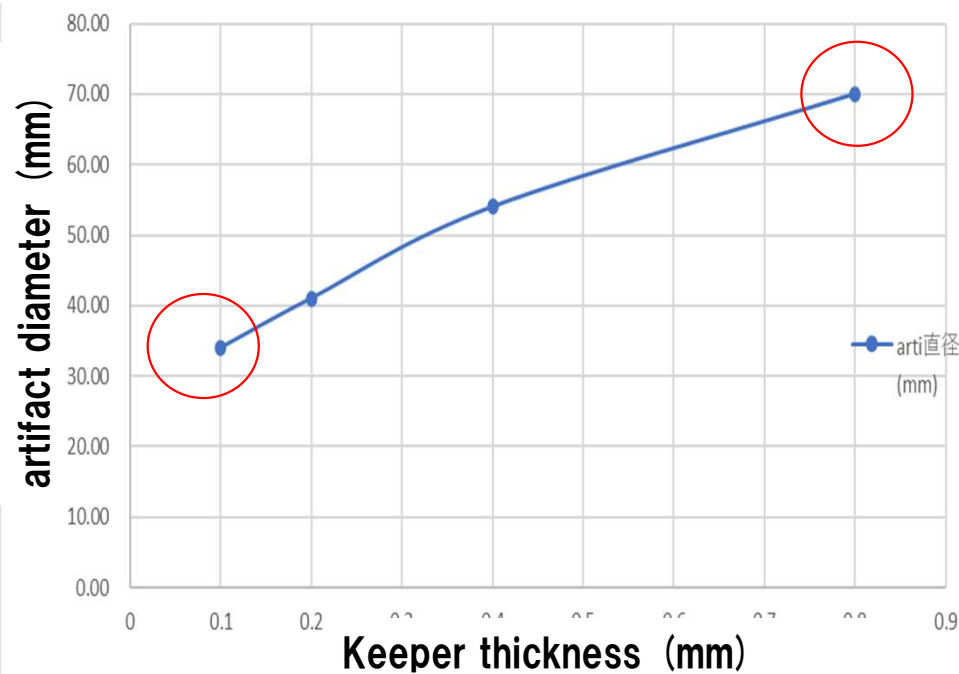


D4mm T:0.1mm

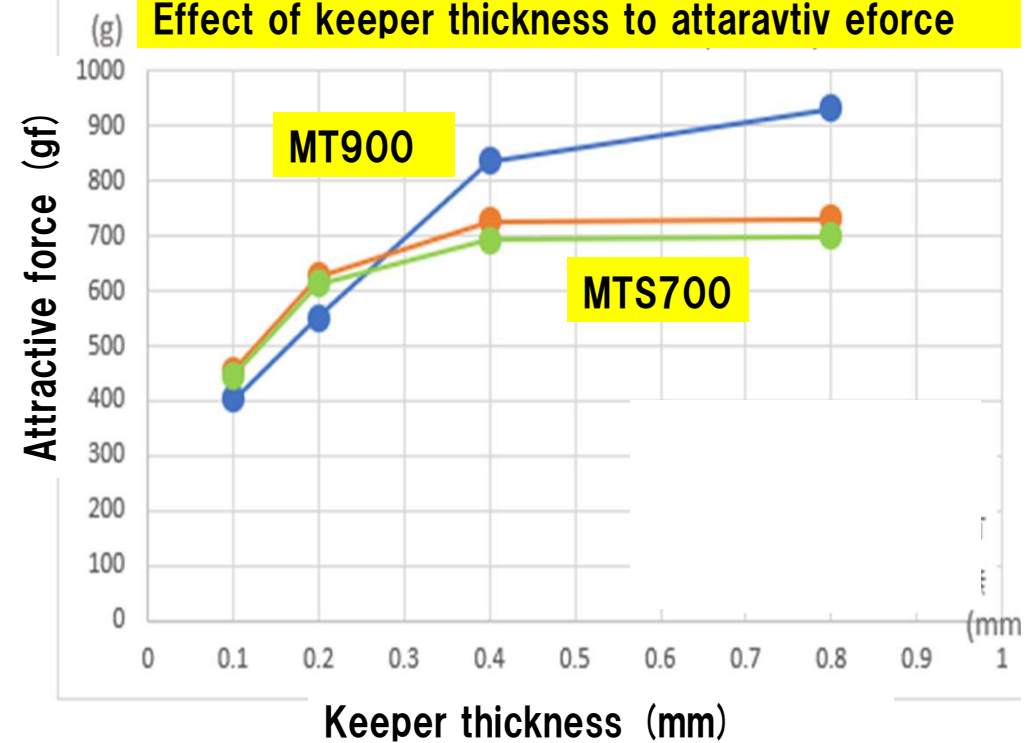
artifact diameter :
34 mm



Effect of keeper thickness to artifact diameter



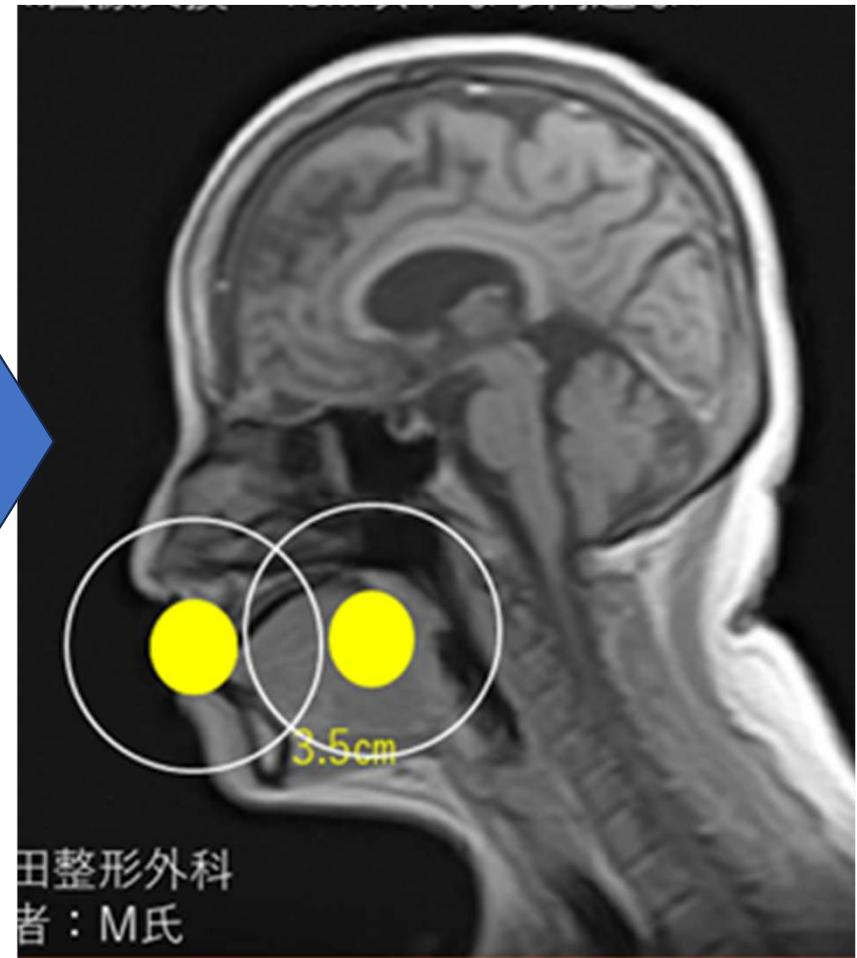
Effect of keeper thickness to attractive force



MRI diagnostic result using a thin keeper with 0.1mm

MRI diagnostic device

MRI artifact images reduced by a thin Keeper from 70mm to under 40mm.
MRI inspection must be no trouble.



Summary

- (1) New technology used by **stainless magnets** can improve dental magnetic attachments on retentive force
 - 50% up for strong type
 - 2 times up for thin type **with thickness of 0.6mm**
- (2) It also decreases production cost over 1/2 compared to existing products
- (3) Clinical applications: **Magnet removable bridges** using sound teeth are the most promising denture technology.
- (4) In future digital denture must be popular and magnetic attachment will become most promising retentive device.

Thank you for your kind attention!

