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# EXTRACTION



# IMMEDIATE REPLANTATION









extraction  
**3-unit bridge**



extraction  
**resin bonded bridge**



extraction  
**implant placement**





surgical  
**crowns lengthening**



orthodontic  
**extrusion**



extraction  
**immediate replantation**

auto**transplantation**

intentional**replantation**

surgical**extrusion**

Plotino G, Abella Sans F, Duggal MS, Grande NM, Krastl G, Nagendrababu V, Gambarini G.

**European Society of Endodontology position statement: Surgical extrusion, intentional replantation and tooth autotransplantation**

Int Endod J. 2021 May;54(5):655-659.

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# auto**transplantation**



,the **transplantation** of a unerupted or erupted teeth in the same individual, **from one site to another**, into extraction sites or surgically prepared sockets'

Plotino G, Abella Sans F, Duggal MS, Grande NM, Krastl G, Nagendrababu V, Gambarini G.

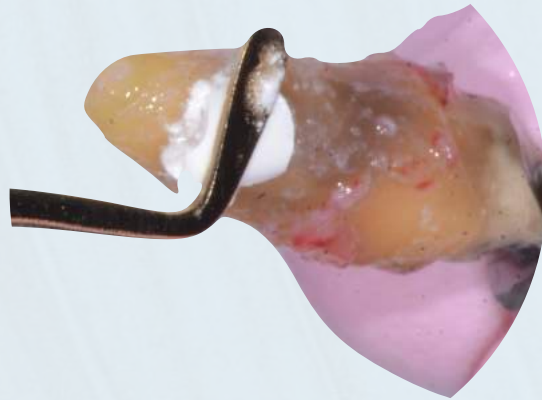
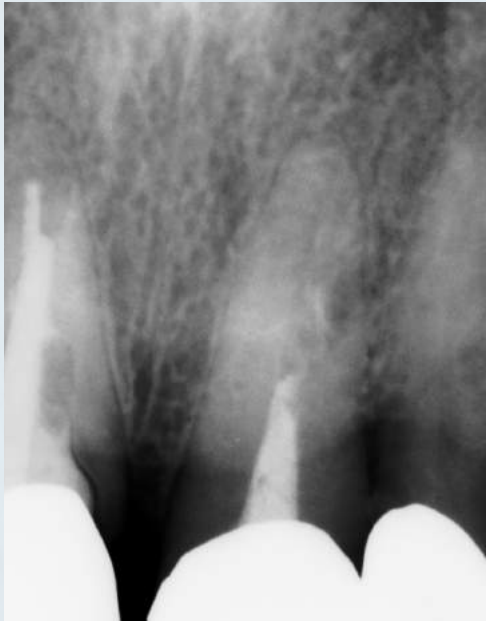
**Clinical procedures and outcome of surgical extrusion, intentional replantation and tooth autotransplantation - a narrative review.**

Int Endod J. 2020 Dec;53(12):1636-1652.

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# intentional **replantation**



## **Persistent apical periodontitis (root resection)**

Areas with limited access/visibility

Proximity to delicate anatomical structures

## **External root resorption**

## **Cervical resorption**

## **Non-accessible perforation**

,the **deliberate extraction** of a tooth and after evaluation of its root surfaces, endodontic **manipulation** and repair, the **placement back** into its **original position** in the socket'

Plotino G, Abella Sans F, Duggal MS, Grande NM, Krastl G, Nagendrababu V, Gambarini G.

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# surgical **extrusion**



,the **deliberate extraction** of a tooth and **repositioning** of the remaining tooth structure at a **more coronal/supragingival position** in the same socket'

Plotino G, Abella Sans F, Duggal MS, Grande NM, Krastl G, Nagendrababu V, Gambarini G.

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# surgical **extrusion**



**Deep subgingival caries**

**Epigingival crown fracture**

**Crown-root fracture**

**Cervical resorption**

**Cervical perforation**

,the **deliberate extraction** of a tooth and **repositioning** of the remaining tooth structure at a **more coronal/supragingival position** in the same socket'

Plotino G, Abella Sans F, Duggal MS, Grande NM, Krastl G, Nagendrababu V, Gambarini G.

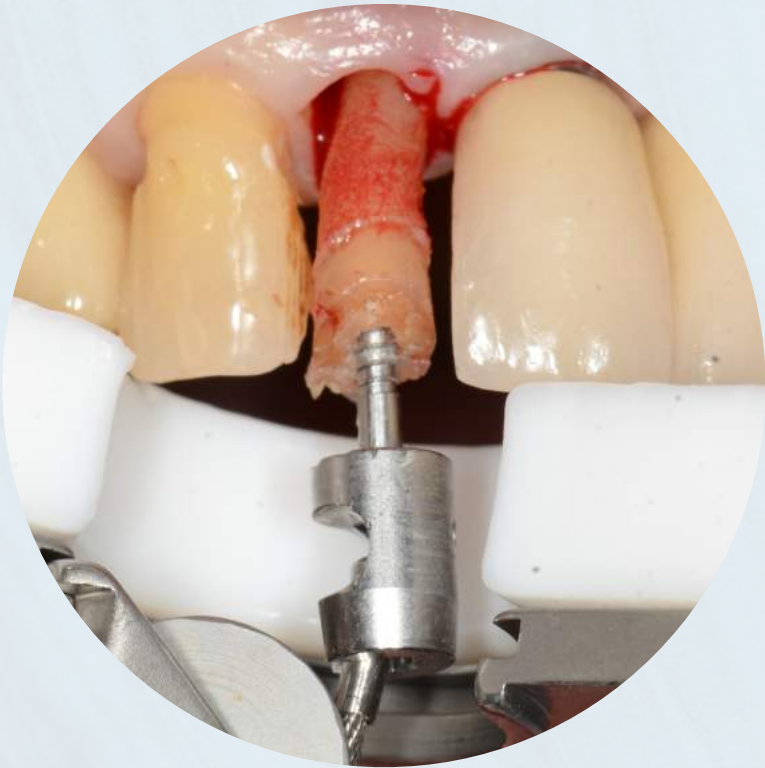
**Clinical procedures and outcome of surgical extrusion, intentional replantation and tooth autotransplantation - a narrative review.**

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## surgical **extrusion**



minimally-invasive  
**extraction**

## intentional **replantation**



knowlegde from  
**traumatology/endondotolgy**

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minimally-invasive **extraction**

=

vertical **extraction**

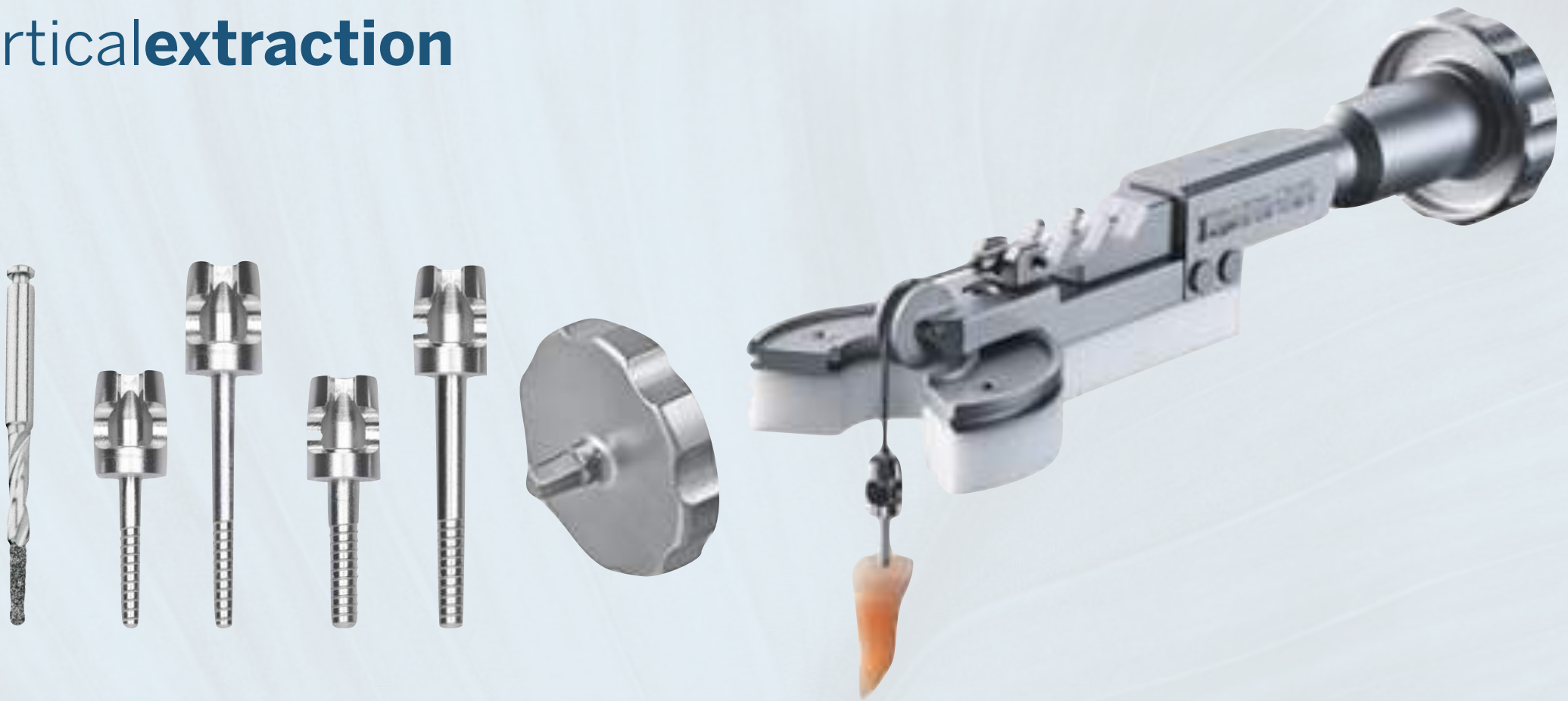
Oikarinen KS, Stoltze K, Andreasen JO.

**Influence of conventional forceps extraction and extraction with an extrusion instrument on cementoblast loss and external root resorption of replanted monkey incisors.**

J Periodontal Res. 1996 Jul;31(5):337-44.

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# vertical**extraction**

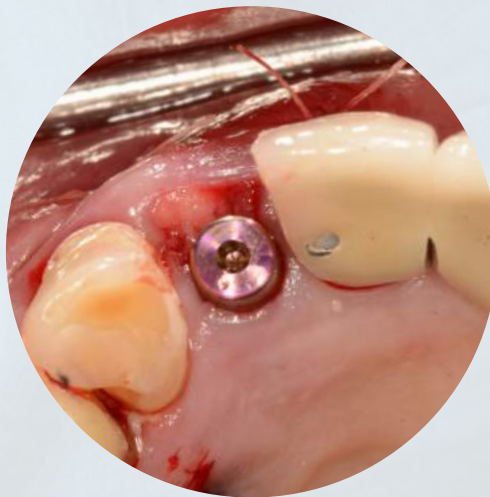


Muska E, Walter C, Knight A, Taneja P, Bulsara Y, Hahn M, Desai M, Dietrich T.  
**Atraumatic vertical tooth extraction: a proof of principle clinical study of a novel system.**  
Oral Surg Oral Med Oral Pathol Oral Radiol. 2013 Nov;116(5):e303-10.

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# vertical extraction



# vertical **extraction**



**N = 72**



**N = 111**



**87%**



**13%**

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Success rate

**89%**

**46%**

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Muska E, Walter C, Knight A, Taneja P, Bulsara Y, Hahn M, Desai M, Dietrich T.

**Atraumatic vertical tooth extraction: a proof of principle clinical study of a novel system.**

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vertical**extraction**

root**morphology**



insufficient**screw-retention**

Muska E, Walter C, Knight A, Taneja P, Bulsara Y, Hahn M, Desai M, Dietrich T.

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# vertical **extraction**

Maximum extraction **forces varied widely** from 41N to 629 N

The **mean maximum extraction force** was **260 N**



**N = 59**

**Pulling time** was highly **correlated** with the maximal **force**

**Root surface area** was **correlated** with the maximal extraction force (larger area = higher forces required)

**Teeth in occlusion** required **higher maximum extraction forces** than teeth not in occlusion (mean: 296 N versus 193 N)

Extraction **forces** were **not associated** with **age, sex or maxilla/mandibula**

traumatology **endodontology**

# root resorption



Petrovic B, Marković D, Peric T, Blagojevic D.

**Factors related to treatment and outcomes of avulsed teeth.**

Dent Traumatol. 2010 Feb;26(1):52-9.

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# traumatology **endodontology**

Short **extra-alveolar time** (less than 15 min)

Gentle **extra-alveolar manipulation** and **minimal-invasive extraction**

Appropriate **storage media**

**Infection control** (Perio/Endo)

Adequate **splinting** (2 - 6 weeks) and control of occlusion



Petrovic B, Marković D, Peric T, Blagojevic D.

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Dent Traumatol. 2010 Feb;26(1):52-9.

vertical**extraction**

traumatology**endodontology**

# SUCCESS

surgical**extrusion**

intentional**replantation**

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surgical **extrusion**



intentional **replantation**



# surgical **extrusion**



# intentional **replantation**



# surgical **extrusion**

# intentional **replantation**



before **treatment**

post **op**

root canal **retreatment**

final **restoration**

## surgical **extrusion**



**N = 11**

**Favourable** results in terms of **periodontal healing** without signs of ankylosis **in 95 - 100 %**

**Case reports/series!**

## intentional **replantation**



**N = 12**

Mainkar A.  
**A Systematic Review of the Survival of Teeth Intentionally Replanted with a Modern Technique and Cost-effectiveness Compared with Single-tooth Implants.**

J Endod. 2017 Dec;43(12):1963-1968.

Torabinejad M, Dinsbach NA, Turman M, Handysides R, Bahjri K, White SN.  
**Survival of Intentionally Replanted Teeth and Implant-supported Single Crowns: A Systematic Review**

J Endod. 2015 Jul;41(7):992-8.

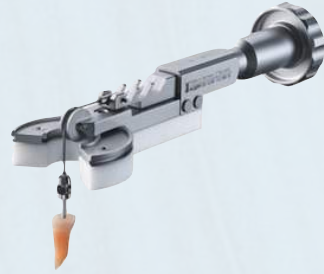
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## surgical **extrusion**



**N = 61**



**N = 51**

Mean Follow-Up: 3.1 years (range: 0.8 - 6.5y)

Mean amount of extrusion: 3.2 mm  
(range: 2.5 - 5.0 mm)

**Success** rate at recall: **92.2 %**

All teeth asymptomatic, no ankylosis

Krug R, Connert T, Soliman S, Syfrig B, Dietrich T, Krastl G.

**Surgical extrusion with an atraumatic extraction system: A clinical study.**

J Prosthet Dent. 2018 Dec;120(6):879-885.

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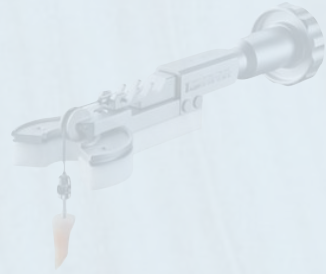
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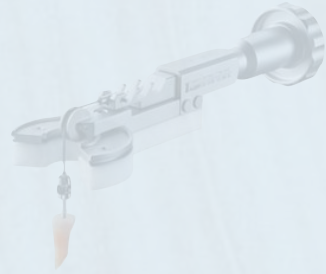
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## intentional **replantation**

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Survival rate	<b>89.1 %</b> <b>(95% CI: 83.8 - 94.4%)</b>
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Survival rate	<b>88 %</b> <b>(95% CI: 81 - 94%)</b>
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Torabinejad M, Dinsbach NA, Turman M, Handysides R, Bahjri K, White SN.

**Survival of Intentionally Replanted Teeth and Implant-supported Single Crowns: A Systematic Review**

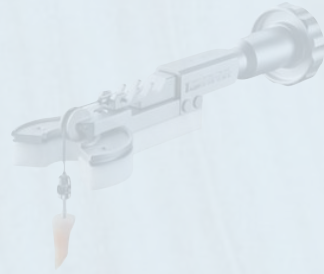
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**Surgical extrusion with an atraumatic extraction system: A clinical study.**

J Prosthet Dent. 2018 Dec;120(6):879-885.

## intentional **replantation**

Although the survival rate of implants is higher, **intentional replantation** is a **more cost-effective treatment** modality.

Intentional replantation should be a treatment option discussed with patients, especially because an **implant can still be placed** if intentional replantation is unsuccessful.

Mainkar A.

**A Systematic Review of the Survival of Teeth Intentionally Replanted with a Modern Technique and Cost-effectiveness Compared with Single-tooth Implants.**

J Endod. 2017 Dec;43(12):1963-1968.

Torabinejad M, Dinsbach NA, Turman M, Handysides R, Bahjri K, White SN.

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extraction  
**implant placement**



orthodontic  
**extrusion**



extraction  
**resin bonded bridge**



**immediate replantation**



extraction  
**implant placement**



orthodontic  
**extrusion**



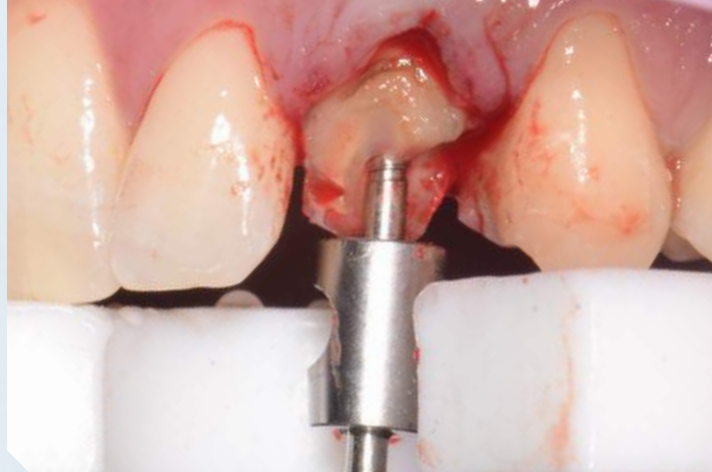
extraction  
**resin bonded bridge**



extraction  
**immediate replantation**



# surgical **extrusion**



# surgical **extrusion**





# surgical **extrusion**



before **treatment**



surgical **extrusion**



root canal **retreatment**



final **crown**



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1

Case selection  
(exclusion of multi-rooted teeth)

2

Infection control (Perio/Endo)

3

Atraumatic extraction

4

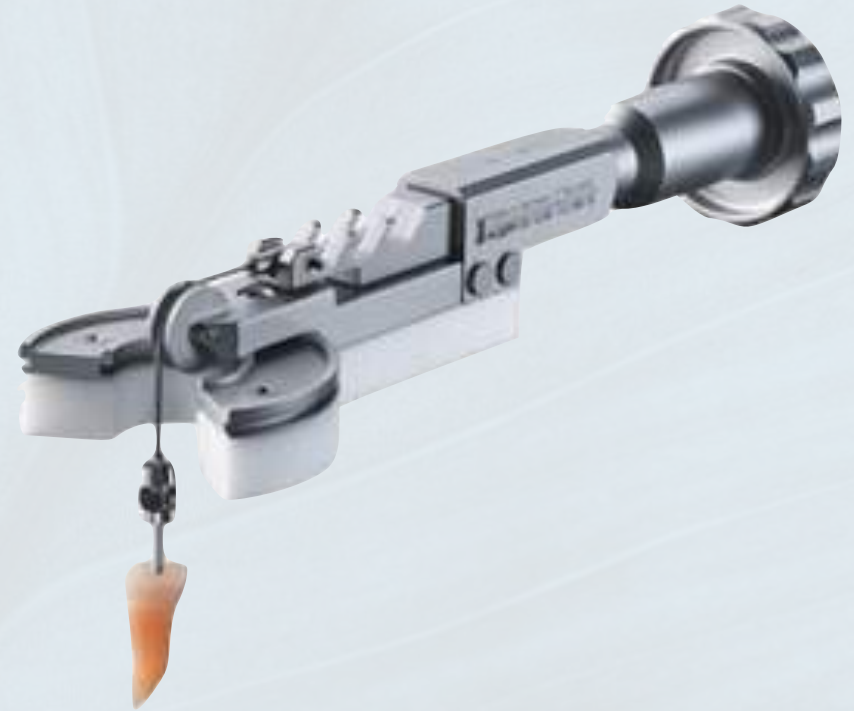
Avoidance of extraoral manipulation

5

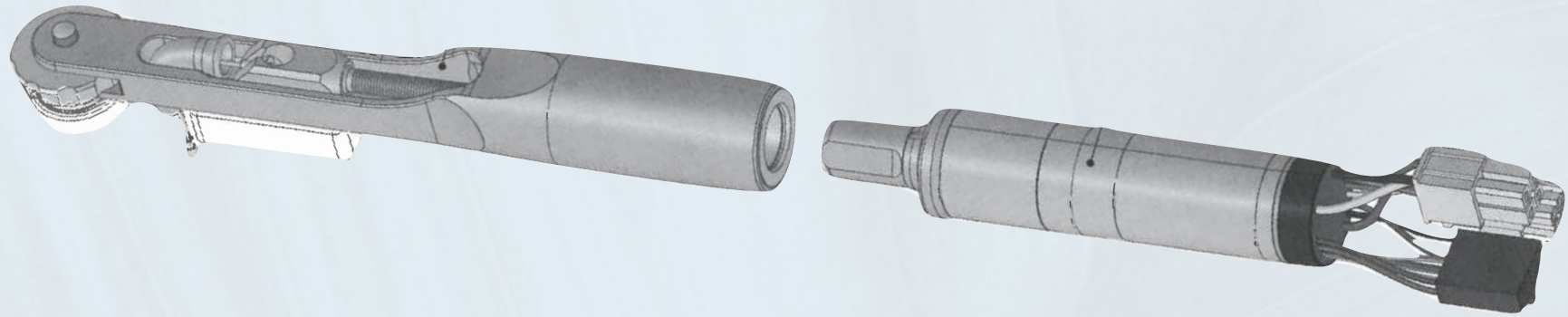
Avoidance of extraoral time

6

Retention and infection control for 3 - 6 weeks



the**future**



## **Semi-automated minimal-invasive tooth extraction in the esthetic zone using a novel vertical extraction system: a case series**

M Iler N, Ioannidis A, Jung RE, Fiscalini L, Pasic P, Zeltner M.

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the**future**



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the**future**



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the**future**



**3months**



**3months**

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# the**future**



before**treatment**



post**op**



final**restoration**



the**future**



vs



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takehome

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**restore the  
unrestorable**



[marco.zeltner@grimmzahnaerzte.ch](mailto:marco.zeltner@grimmzahnaerzte.ch)



Marco Zeltner



Marco Zeltner