

Trattamento delle ONJ: update della letteratura (2014-2018)

Piezosurgery

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Chirurgia Ossea Piezoelettrica

La piezosurgery viene sviluppata alla **fine degli anni '90** da un'idea di **Tommaso Vercellotti**.

Venne creato un **manipolo** che sviluppava un **movimento composto da 2 oscillazioni** aventi la stessa direzione ma **frequenze di taglio differenti**.

Il risultato fu una **capacità taglio maggiore**, con **riduzione degli attriti** e quindi del calore sviluppato.



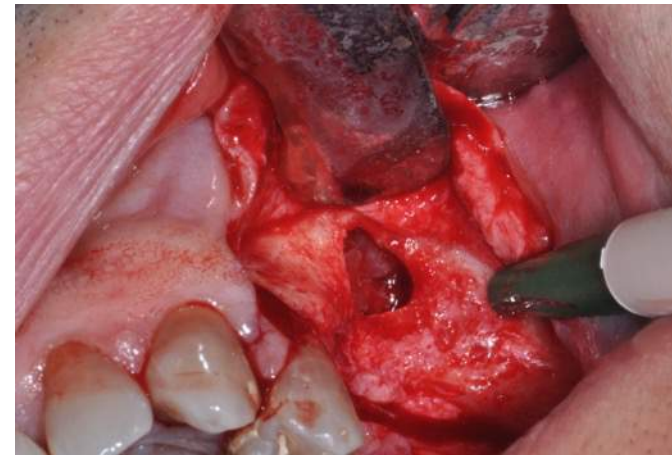
Caratteristiche della piezosurgery

Precisione di taglio: dovuta alle oscillazioni di 20-80 micron.

Selettività di taglio: agisce solo sui tessuti mineralizzati.

Controllo intraoperatorio e rapida curva di apprendimento: l'azione di taglio necessita di una lieve pressione (500gr).

Campo operatorio esangue: la soluzione salina sviluppa un effetto cavitazionale, grazie alle micro-vibrazioni dell'inserto.



Caratteristiche della piezosurgery

Guarigione ossea favorevole: l'azione di taglio genera un **superficie osteotomica regolare** con la presenza di **osteociti vitali**; rispetto alla superficie irregolare ricoperta di detriti ossei legata all'azione di seghe o frese

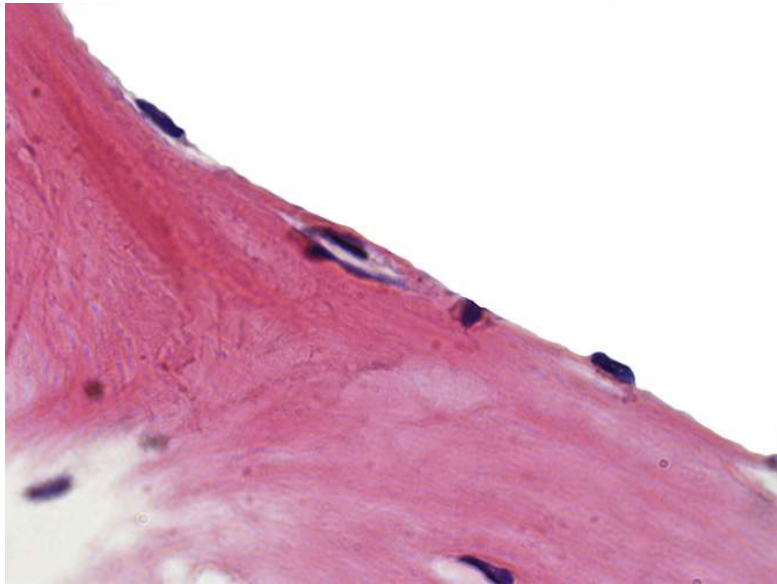


Fig. 3. Morphologic analysis of bone samples (haematoxylin-eosin staining). Bone samples taken with the Piezoelectric device showed a well-organized and well-vascularised bone with a lamellar architecture surrounding the Haversian channels and with linear osteotomies.

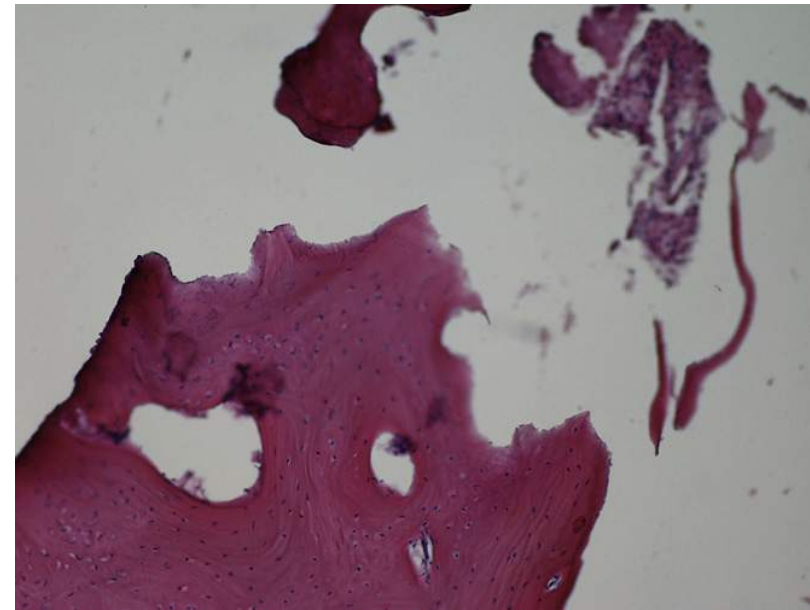


Fig. 4. Morphologic analysis of bone samples (haematoxylin-eosin staining). Bone samples harvested with the burr showed irregular osteotomy lines with evidence of bone heat osteonecrosis.

Vercellotti T. Piezosurgery, elementi essenziali. Vantaggi clinici n Odontoiatria. Quintessenza 2009

Rullo R, Addabbo F, Papaccio G, D'Aquino R, Festa VM. Piezoelectric device vs. conventional rotative instruments in impacted third molar surgery: relationships between surgical difficulty and postoperative pain with histological evaluations. J Craniomaxillofac Surg. 2013 Mar;41(2):e33-8.

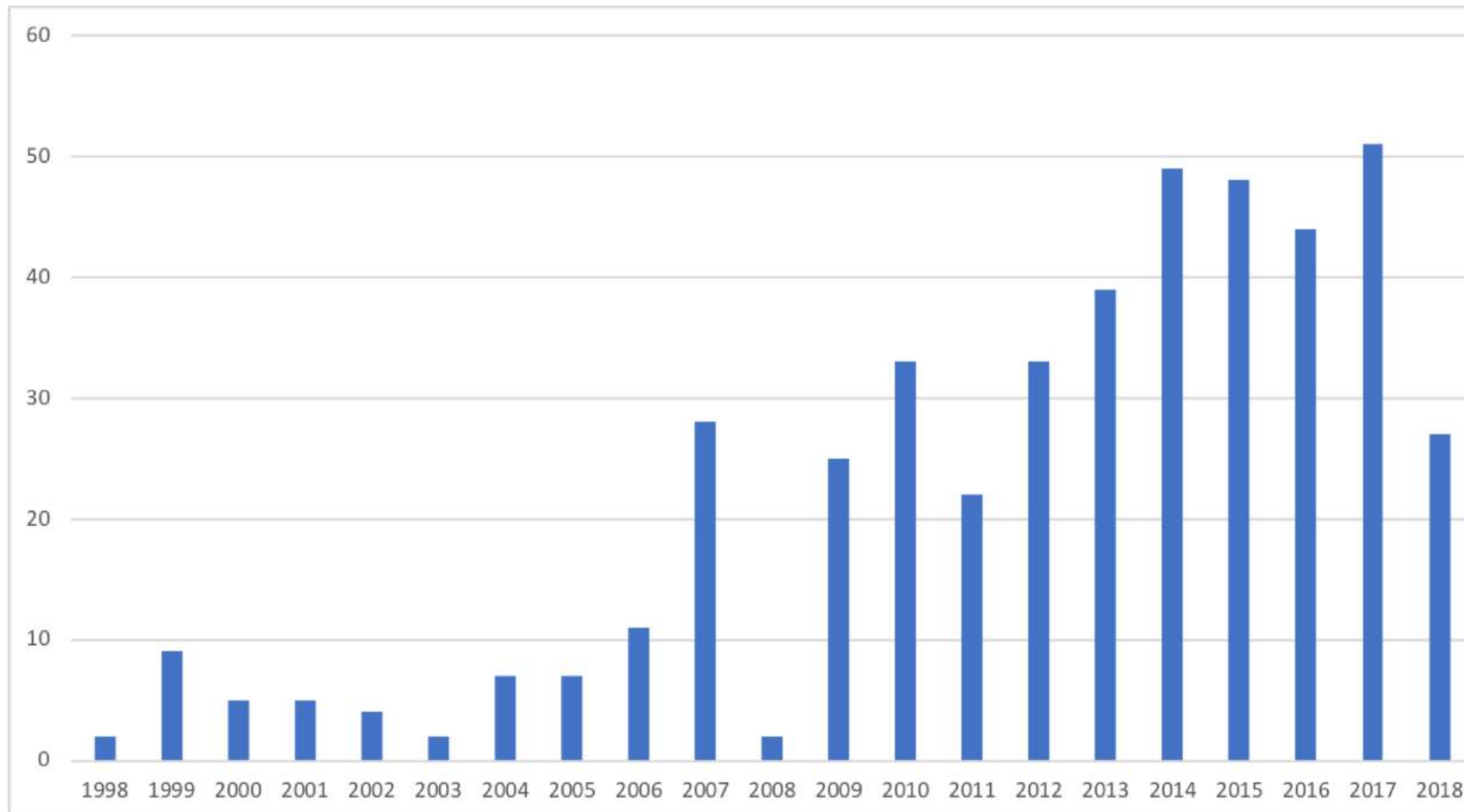
Interesse scientifico per chirurgia ossea piezoelettrica

NCBI Resources How To

PubMed.gov
US National Library of Medicine
National Institutes of Health

PubMed piezoelectric bone Search

Create RSS Create alert Advanced



<https://www.ncbi.nlm.nih.gov/pubmed/?term=piezoelectric+bone>

Piezosurgery in ONJ terapia - Letteratura 2014-2018



Piezosurgery in ONJ terapia -Letteratura 2014-2018

Eleggibilità studi: studi su umani in cui sono stati applicati solo strumenti piezoelettrici nel trattamento delle ONJ, qualsiasi lingua, anni 2014-2018, almeno 5 casi

Databases: PubMed, Ovide/MEDLINE, Web of Knowledge, Embase

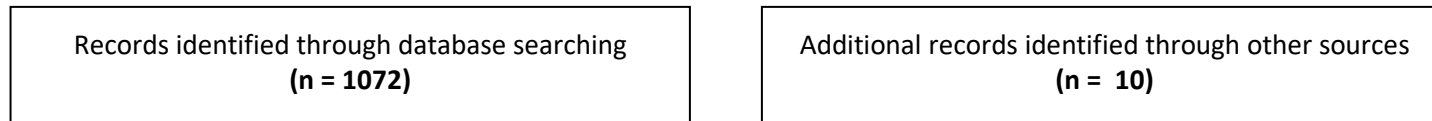
Parole chiave: piezosurgery, piezoelectric, ultrasonic, osteonecrosis, ONJ, BRONJ, MRONJ, treatment

Identificazione degli studi: Dopo la rimozione dei duplicati, sono stati applicati i criteri di inclusione/esclusione ai titoli e agli abstract. Successivamente sono stati analizzati i testi degli articoli selezionati.

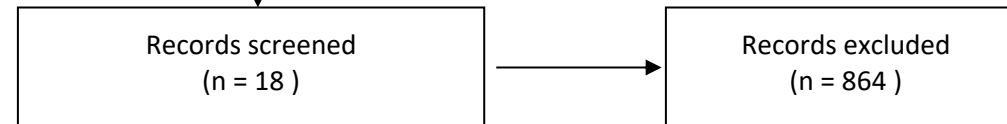
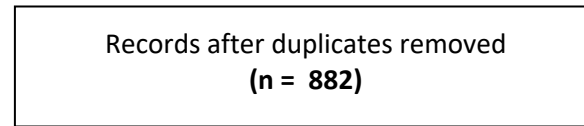
Raccolta dati: disegno dello studio, *setting*, *sample size*, dati demografici pazienti, fumatori, tipo e dose del farmaco ONJ-relato, patologia primaria, tipo del trattamento chirurgico, sede ONJ, definizione *outcome* e risultati, durata follow-up, complicazioni, recidiva di ONJ.

Piezosurgery e letteratura 2014-2018 (dato originale dello speaker)

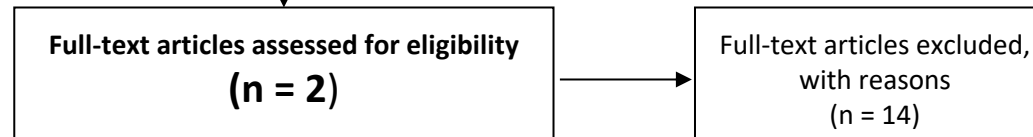
Identification



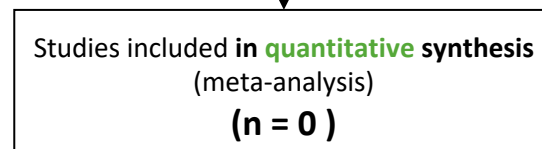
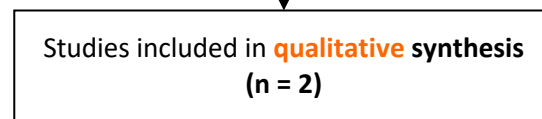
Screening



Eligibility



Included



1° paper

[Int J Dent](#). 2014;2014:935657. doi: 10.1155/2014/935657. Epub 2014 Jun 5.

New dimensional staging of bisphosphonate-related osteonecrosis of the jaw allowing a guided surgical treatment protocol: long-term follow-up of 266 lesions in neoplastic and osteoporotic patients from the university of bari.

[Franco S¹](#), [Miccoli S¹](#), [Limongelli L¹](#), [Tempesta A¹](#), [Favia G²](#), [Maiorano E³](#), [Favia G¹](#).

- Studio retrospettivo, monocentrico, Ospedaliero-Universitario
- **203 pazienti inclusi**: 75.37% donne, età media 67.8 ± 11.3 anni.
- **71.43% pazienti oncologici** con metastasi ossee: farmaco più assunto zoledronato (terapia media 26.3 ± 17.9 mesi)
- **28.57% pazienti osteometabolici**, farmaco più assunto alendronato (terapia media 37 ± 37.2 mesi)
- La **mandibola** è stata più colpita rispetto alla mascella, con un rapporto di **18:1**
- Sono stati intrapresi **266 atti chirurgici**. Periodo di drug holiday medio 7 ± 7.6 mesi

Franco S, et al. New dimensional staging of bisphosphonate-related osteonecrosis of the jaw allowing a guided surgical treatment protocol: long-term follow-up of 266 lesions in neoplastic and osteoporotic patients from the university of bari. [Int J Dent](#). 2014;2014:935657.



New dimensional staging of bisphosphonate-related osteonecrosis of the jaw allowing a guided surgical treatment protocol: long-term follow-up of 266 lesions in neoplastic and osteoporotic patients from the university of bari.

Franco S¹, Miccoli S¹, Limongelli L¹, Tempesta A¹, Favia G², Maiorano E³, Favia G¹.

TABLE 3: Patients clinical data (N = 203).

	N	%
Patients characteristics		
Males	50	24.63%
Females	153	75.37%
Mean age	67.8 ± 11.3	
Neoplastic patients		
Breast cancer	58	40%
Multiple myeloma	42	28.97%
Prostate cancer	20	13.79%
Lung cancer	5	3.45%
Others	20	13.79%
Osteoporotic patients		
Type of BPs treatment		
Oral administration	46	22.66%
Parenteral administration	157	77.34%
Neoplastic patients		
Zoledronic acid	137	94.48%
Clodronate	4	2.76%
Risedronate	3	2.07%
Pamidronate	1	0.7%
Mean duration therapy	26.3 ± 17.9 months	
Osteoporotic patients		
Alendronate	30	51.72%
Clodronate	8	13.79%
Ibandronate	5	8.62%
Zoledronic acid	4	6.9%
Risedronate	4	6.9%
Off-label therapy	7	12.1%
Mean duration therapy	37 ± 37.2 months	

TABLE 4: BRONJ lesions (N = 277).

	N	%
Clinical stage (AAOMS)		
Lesions in neoplastic patients		
Stage 0	1	0.51%
Stage 1	14	7.18%
Stage 2	115	58.97%
Stage 3	65	33.33%
Lesions in osteoporotic patients		
Stage 0	1	1.4%
Stage 1	2	2.82%
Stage 2	53	74.65%
Stage 3	15	21.13%
Dimensional stage		
Lesions in neoplastic patients		
Stage 0	1	0.51%
Stage I	22	11.28%
Stage II	58	29.74%
Stage III	114	58.5%
Lesions in osteoporotic patients		
Stage 0	1	1.41%
Stage I	13	18.31%
Stage II	28	39.44%
Stage III	29	40.84%
Medium size	3.8 ± 1.6 cm	
History of extractions	169	63.53%
Initial symptoms per lesion (N = 266)		
Pain	233	87.59%
Suppuration	198	74.43%
Paraesthesia	78	29.32%
Fistulas	46	17.29%
Maxillary sinus involvement	34	12.78%

New dimensional staging of bisphosphonate-related osteonecrosis of the jaw allowing a guided surgical treatment protocol: long-term follow-up of 266 lesions in neoplastic and osteoporotic patients from the university of bari.

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Il protocollo proposto prevede:

- **terapia medica:** "*ceftriaxone (1g once a day i.m.) and metronidazole (500 mg twice a day per os) administered for 8 days with 10 day interruption after each cycle*" ("at least 3 cycles")
- **Protocollo chirurgico:** "*... marginal bone resection included at least 1cm of vascularized bone tissue extended...the depth of resection was pinpointed by the bleeding evaluation of bone tissues...Surgery was complemented by using vibrating tips connected to a high power ultrasonic device (piezosurgery) for the osteoplasty of the residual resection margins...*"



FIGURE 4: Clinical and radiological aspects of a peri-implantar Stage III BRONJ in a 55-year-old patient with breast cancer.



FIGURE 5: Alveolar bone marginal resection and intraoperative intracavitary application of Aminogam gel.

1° paper

Int J Dent. 2014;2014:935657. doi: 10.1155/2014/935657. Epub 2014 Jun 5.

New dimensional staging of bisphosphonate-related osteonecrosis of the jaw allowing a guided surgical treatment protocol: long-term follow-up of 266 lesions in neoplastic and osteoporotic patients from the university of bari.

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Risultati

Il **follow-up** ha avuto sempre **durata superiore ai 12 mesi**, con più di 30 mesi nell'80% dei pazienti osteometabolici

Il **successo clinico** è stato valutato come:

- Completa guarigione, in assenza di sintomi e segni clinico radiografici
- Transizione da uno stadio superiore ad uno inferiore (*healing improvement*)
- guarigione con *effetti collaterali* a livello osseo, parodontale o dentale

Ad un anno, **84.96%** delle lesioni sono guarite, mentre il 12.78% sono recidivate

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TABLE 5: Treatment outcomes (N = 266).

	N	%
<i>Clinical success</i>	226	84.96%
Neoplastic patients (195 lesions)	159	81.54%
Osteoporotic patients (71 lesions)	67	94.37%
<i>Recurrences</i>	34	12.78%
Neoplastic patients (195 lesions)	30	15.39%
Osteoporotic patients (71 lesions)	4	5.63%
<i>Lesions in patients who succumbed</i>		
Neoplastic patients (195 lesions)	6	3.08%



Treatment of medication-related osteonecrosis of the jaws (MRONJ) with ultrasonic piezoelectric bone surgery. A case series of 20 treated sites.

Blus C¹, Giannelli G², Szmukler-Moncler S³, Orru G³.

- Studio prospettico, monocentrico, Ospedaliero
- **18 pazienti arruolati:** 13 donne e 5 uomini, di età media 69.1 ± 8.3 anni.
- **13 pazienti oncologici** con metastasi ossee: 12 in terapia con zoledronato (terapia media 33.7 ± 16.4 mesi) e 1 con pamidronato (9 mesi)
- **5 pazienti osteometabolici**, tutti in terapia con alendronato (terapia media 63.8 ± 34.7 mesi)
- **14 pazienti affetti da ONJ in sede mandibolare, 5 nel mascellare superiore.**

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Table 1 Demographic data of the patients, their BiP treatment, and their respective follow-up

Pat number	Pat initials	Sex	Age	Primary disease	BiP treatment	Length of BiP treatment (months)	Triggering cause of MRONJ	Osteonecrotic area	ONJ classification	Time between start of BiP intake and MRONJ diagnosis (months)	Time between end of BiP intake and MRONJ diagnosis (months)	Time between surgery and last follow-up (months)	BiP treatment discontinued
1	MA	F	79	Breast cancer	Zoledronate (Zometa)	15	Extraction of # 43, 44	Mandible, Left anterior area	ONJ 3	15.5	0.5	27, deceased	Yes
2	TMT	F	64	Osteoporosis	Alendronate (Fosavance)	94	Extraction of # 38	Mandible, Left posterior area	ONJ 2	95	1	54	No
3	IG	F	77	Osteoporosis	Alendronate (Fosavance)	29	Extraction of # 46	Mandible, Posterior at # 46	ONJ 3	29	0	53	Yes
4	DF	M	68	Multiple myeloma	Zoledronate (Zometa)	38	Extraction of # 36, 37, 46, 47	Mandible, Bilateral posterior at # 36-37 & 46-47	ONJ 3	44	6	47	Yes
5	DTG	F	87	Multiple myeloma	Zoledronate (Zometa)	40	Extraction of # 25, 26	Maxilla, Posterior at # 25-26	ONJ 3	45	5	10, deceased	Yes
6	SM	F	81	Osteoporosis	Alendronate (Fosavance)	28	Extraction of # 11, 12	Maxilla, Anterior at # 11-12	ONJ 2	28	0	39	Yes
7	BA	M	77	Prostate cancer	Zoledronate (Zometa)	33	Traumatic ill-fitted prosthesis	Mandible, Anterior at # 33-34	ONJ 2	36	3	41	Yes
8	DAM	M	62	Gastric adenoma	Zoledronate (Zometa)	26	Traumatic ill-fitted prosthesis	Mandible, Anterior at # 31-43	ONJ 2	27	1	36	Yes
9	GP	M	60	Multiple myeloma	Zoledronate (Zometa)	20	Extraction of # 16, 17	Maxilla, Posterior at # 16-17	ONJ 3	21	1	28	Yes
10	NL	F	69	Osteoporosis	Alendronate (Alendros 70)	70	Extraction of # 47	Mandible, Posterior at # 47	ONJ 2	74	4	14	Yes
11	MLG	F	62	Breast cancer	Zoledronate (Zometa)	12	No apparent cause	Mandible, Posterior at # 47-48	ONJ 2	13	1	26	Yes
12	BM	F	71	Breast cancer and osteoporosis	Alendronate (Alendros 70)	121	Gingivoplasty at # 47	Mandible, posterior at # 47	ONJ 2	121	0	23	No
13	MS	F	59	Multiple myeloma	Zoledronate (Zometa)	13	Extraction of # 43, 44	Mandible, Left anterior area	ONJ 2	14	1	20, deceased	No
14	FA	F	65	Breast cancer	Zoledronate (Zometa)	35	Extraction of # 27	Maxilla, Posterior at # 27	ONJ 2	37	2	18	Yes
15	DM	F	67	Breast cancer	Pamidronate (Aredia)	9	Periodontal disease	Mandible, Posterior at # 36-37	ONJ 2	9	0	16	Yes
16	MD	M	71	Kidney cancer	Zoledronate (Zometa)	57	Extraction of # 45	Mandible, Posterior at # 45	ONJ 2	59	2	16	Yes
					Zoledronate (Zometa)	57	No apparent cause	Maxilla, Posterior at # 24	ONJ 3	65	8	10	Yes
17	DPA	F	59	Osteoporosis	Alendronate (Fosavance)	41	Extraction of # 36, 37	Mandible, Left posterior area	ONJ 2	47	6	13	Yes
18	RD	F	67	Breast cancer	Zoledronate (Zometa)	58	Extraction of # 38	Mandible, Left posterior area	ONJ 2	60	2	13	No

Oral Maxillofac Surg (2017) 21:41-48

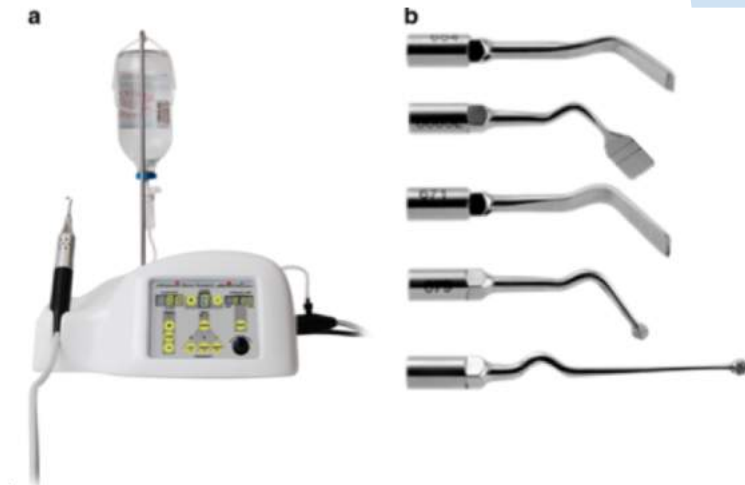
Treatment of medication-related osteonecrosis of the jaws (MRONJ) with ultrasonic piezoelectric bone surgery. A case series of 20 treated sites.

Blus C¹, Giannelli G², Szmukler-Moncler S³, Orru G³.

Sono stati intrapresi **20 atti chirurgici**. 14 pazienti avevano sospeso l'assunzione di BPs

Il protocollo proposto prevede:

- **terapia medica:** "*amoxicillin + clavulanic acid 2g/d + metronidazole 1g/d for 2weeks, it started 3 days before surgery*"
- **Protocollo chirurgico:** "*...a loco-regional anesthesia...without vasoconstrictor, a flap was raised...Bone was removed until bleeding areas were obtained...a gingivoplasty was performed before primary closure of the gingiva was performed.*"



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Risultati

Il follow-up ha avuto una durata compresa tra i 10 e 54 mesi, **ad un anno nessun paziente mostrava segni e/o sintomi di ONJ.**



Table 2 Progression of the symptoms at the 1 month follow-up. No change was subsequently observed at the later milestones. *Healed* means that the observed symptom disappeared, *abated* means that the symptom decreased but did not completely disappear, - means absence of the corresponding symptom

	MA Pat 1	TMT Pat 2	IG Pat 3	DF-1 Pat 4.1	DF-2 Pat 4.2	DTG Pat 5	SM Pat 6	BA Pat 7	DAM Pat 8	GP Pat 9	NL Pat 10	MLG Pat 11	BM Pat 12	MS Pat 13	FA Pat 14	DM Pat 15	MD-1 Pat 16.1	MD-2 Pat 16.2	DPA Pat 17	RD Pat 18	
Spontaneous bleeding	Healed	Healed	Healed	Healed	Healed	Healed	Healed	Healed	Healed	Healed	Healed	Healed	Healed	Healed	Healed	Healed	Healed	Healed	Healed	Healed	
Purulent exudate	Healed	Healed	Healed	Healed	Healed	-	Healed	Healed	Healed	Healed	Healed	Healed	-	Healed	-	Healed	Healed	Healed	Healed	Healed	-
Intense localized pain	Healed	-	Healed	Healed	Healed	Healed	Healed	Healed	-	Healed	Healed	Healed	-	Healed	Healed	Healed	Healed	Healed	Healed	Healed	-
Feeding difficulty	Healed	-	Healed	Healed	Healed	Healed	Healed	Healed	-	-	Healed	Healed	Healed	Healed	Healed	Healed	Healed	Healed	Healed	Healed	Healed
Halitosis	Healed	Healed	Healed	Healed	Healed	Healed	Healed	Healed	Healed	Healed	Healed	Healed	-	Healed	Healed	Healed	Healed	Healed	Healed	Healed	Healed
Tumefaction	Healed	Healed	Healed	Healed	Healed	-	Healed	Healed	-	-	Healed	Healed	-	-	-	Healed	Healed	Healed	Healed	Healed	-
Exposed bone	Healed	-	-	Healed	Healed	Healed	-	Healed	Healed	Healed	-	Healed	Healed	Healed	Healed	-	Healed	Healed	Healed	Healed	Healed
Soft tissue ulceration	Healed	Healed	Healed	Healed	Healed	Healed	Healed	Healed	Healed	-	Healed	Healed	Healed	-	-	Healed	Healed	Healed	Healed	Healed	Healed
Local swelling	Healed	Healed	Healed	Healed	Healed	Healed	Healed	Healed	Healed	-	Healed	Healed	Healed	-	Healed	Healed	Healed	Healed	Healed	Healed	Healed
Fistula	-	Healed	Healed	-	-	Healed	Healed	-	Healed	-	Healed	Healed	-	-	-	Healed	Healed	Healed	Healed	Healed	-
Trismus	-	-	<u>Abated</u>	-	-	-	-	-	-	-	Healed	-	-	-	-	Healed	-	-	Healed	-	-
Paresthesia	-	-	-	-	-	-	-	-	-	-	<u>Abated</u>	-	-	-	-	-	-	-	-	-	-

Piezosurgery e letteratura 2014-2018

1°
paper

Int J Dent. 2014;2014:935657. doi: 10.1155/2014/935657. Epub 2014 Jun 5.

New dimensional staging of bisphosphonate-related osteonecrosis of the jaw allowing a guided surgical treatment protocol: long-term follow-up of 266 lesions in neoplastic and osteoporotic patients from the university of Bari.

Franco S¹, Miccoli S¹, Limongelli L¹, Tempesta A¹, Favia G², Maiorano E³, Favia G¹.

N°266 interventi
84,96%

2°
paper

Oral Maxillofac Surg. 2017 Mar;21(1):41-48. doi: 10.1007/s10006-016-0597-7. Epub 2016 Dec 6.

Treatment of medication-related osteonecrosis of the jaws (MRONJ) with ultrasonic piezoelectric bone surgery. A case series of 20 treated sites.

Blus C¹, Giannelli G², Szmukler-Moncler S³, Orru G³.

N°20 interventi
100%

Clin Oral Investig. 2018 Mar;22(2):597-615. doi: 10.1007/s00784-017-2325-6. Epub 2018 Jan 13.

Stage-specific therapeutic strategies of medication-related osteonecrosis of the jaws: a systematic review and meta-analysis of the drug suspension protocol.

Ramaglia L¹, Guida A¹, Iorio-Siciliano V¹, Cuzzo A¹, Blasi A¹, Sculean A².

"from the 13 selected studies, 618 sites with ONJ were enrolled in this statistical analysis..."

"...surgical therapy shows very heterogeneous results at every stage (stage I range 0–100%, stage II range 52–100%, stage III range 50–100%)"

Ramaglia L, Guida A, Iorio-Siciliano V, Cuzzo A, Blasi A, Sculean A. Stage-specific therapeutic strategies of medication-related osteonecrosis of the jaws: a systematic review and meta-analysis of the drug suspension protocol. Clin Oral Investig. 2018 Mar;22(2):597-615.

Percorso assistenziale di prevenzione e terapia per ONJ

PROMaF

SiPMO
Società Italiana di Patologia e Medicina Orale

P.R.O.Ma.F.



Prevenzione e **R**icerca sull'**O**steonecrosi delle **O**ssa
Mascellari da **F**armaci

(già percorso PROMaB – Prevenzione e Ricerca dell'Osteonecrosi delle ossa Mascellari da Bisfosfonati, patrocinato dall'Assessorato alla Sanità – Regione Sicilia – Prot. n.2779 del 12/04/2007)

Protocollo **PROMaF** (according to Raccomandazioni 1.1. SICMF-SIPMO)

Fase pre-operativa:

Esami strumentali di II livello (e.g. TC)

Ablazione Tartaro, quando indicata 2/3 settimane prima dell'intervento

Valutazione **sospensione del farmaco ONJ-relato**

Terapia medica pre-chirurgica

- **Collutorio 0,12% Clorexidina senza alcol**: 3 volte/die a partire da 10 gg prima dell'estrazione e per i 15 gg successivi
- **Antibiotico terapia a largo spettro**: Ampicillina+Sulbactam fl 2gr – 2 volte die + Metronidazolo[°] cpr 250 mg – 2 cpr ogni 8h; da iniziare il giorno prima dell'interevento e per i 6 gg successivi.

- **Probiotici gastro-intestinali**



[°] Uso offlabel, è necessario il consenso informato

Protocollo PROMaF (according to Raccomandazioni 1.1. SICMF-SIPMO)

Procedure chirurgiche per ONJ:

Osteoplastica di superficie

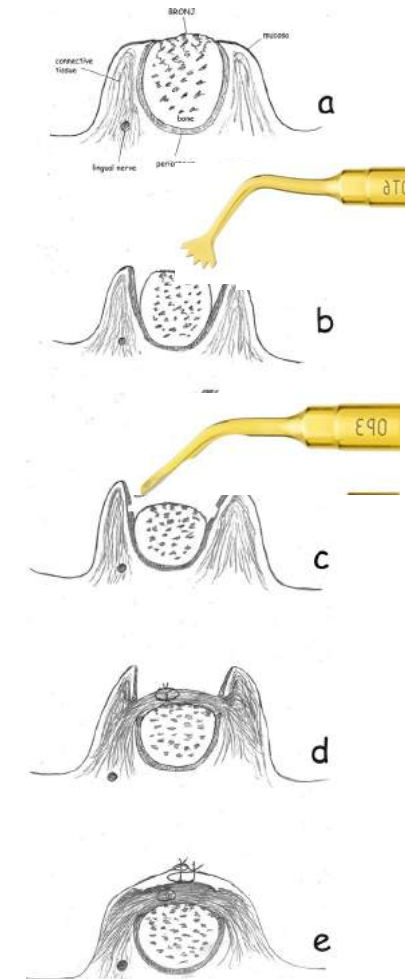
Curettage

Sequestrectomia

Chirurgia resettiva

Fasi operative:

- Sciacquo preoperatorio con collutorio 0,20% CHX per 1 minuto
- Anestesia locale senza vasocostrittore
- Lembo mucoperiosteo a tutto spessore con incisioni di scarico (quando indicato)
- Rimozione dell'osso necrotico e osteoplastica dei margini ossei mediante utilizzo di piezosurgery
- Irrigazione intra-alveolare con antibatterico (i.e. Rifamicina sodica)
- Adattamento del lembo privo di tensioni e sutura per favorire guarigione di prima intenzione

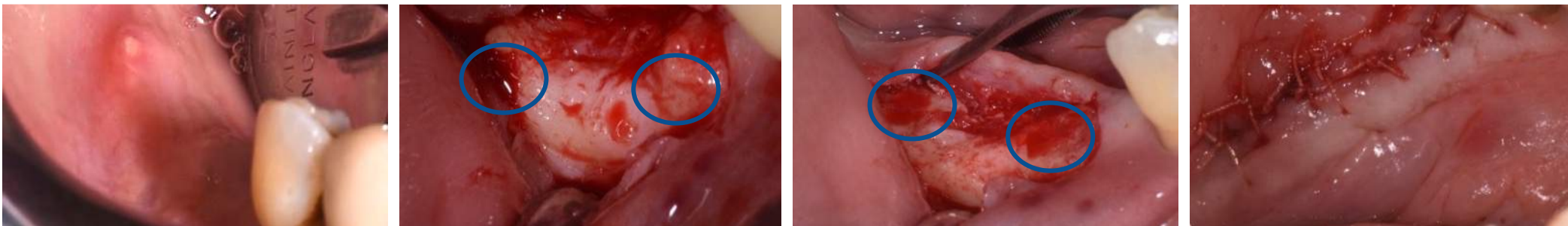


Procedure chirurgiche per ONJ by PIEZO

Osteoplastica di superficie



Curettage

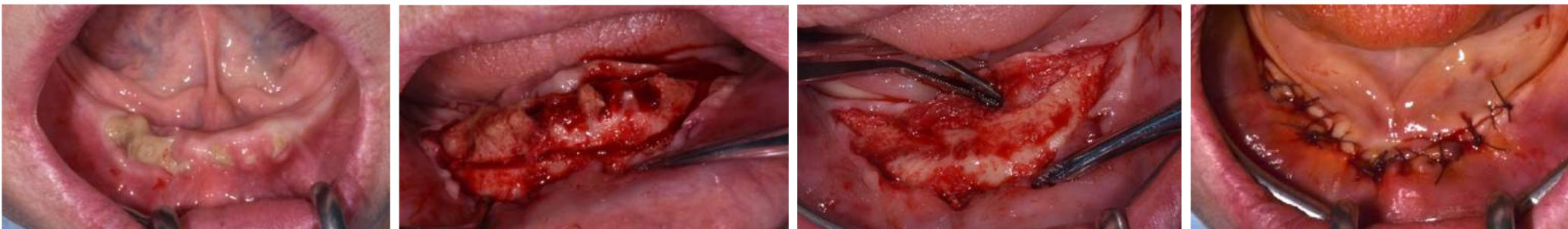


Procedure chirurgiche per ONJ by PIEZO

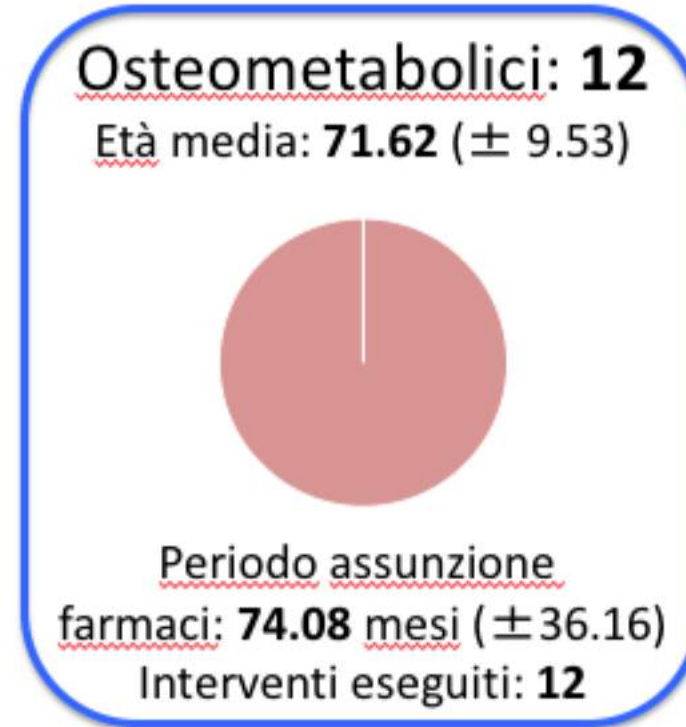
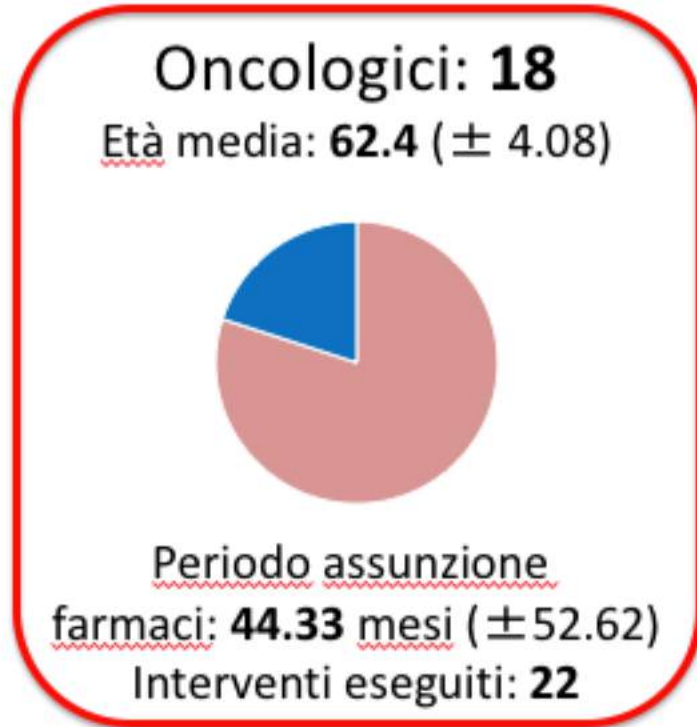
Sequestrectomia



Chirurgia resettiva



Risultati (ongoing)



Interventi eseguiti: **34**

A **12 mesi**, il **91,2%** delle lesioni sono guarite

- Tutti i pazienti arruolati non erano stati sottoposti a misure di prevenzione primaria -

Conclusioni

Gli studi in letteratura e la nostra esperienza confermano i **vantaggi della chirurgia piezoelettrica:**

- ✓ precisione e selettività del taglio
- ✓ guarigione ossea favorevole
- ✓ rapida curva di apprendimento

I lavori in cui vi è esclusivo utilizzo di strumenti piezoelettrici nel trattamento di ONJ mostrano **risultati comparabili con gli strumenti tradizionali.**





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Policlinico Paolo Giaccone di Palermo

P.R.O.Ma.F.

Prevenzione e Ricerca sull'Osteonecrosi
delle ossa **M**ascellari da **F**armaci



On Off

Osteonecrosis
Oral Findings & Future



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ORDINE MEDICO CHIRURGO
ODONTOIATRICO



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RACCOMANDAZIONI
CLINICO-TERAPEUTICHE
SULL'OSTEONECROSIS DELLE
OSSA MASCELLARI (ONJ)
ASSOCIATA A FARMACI E SUA
PREVENZIONE

CD REALIZZATO
A OPERA DI

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Bedogni Alberto
Campisi Giuseppina
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D'Alessandro Natale
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