Quick Reference Guide
Decreasing the Risks of Developing Drug Induced Osteonecrosis of the Jaws (DIONJ)

Adapted from the Division of Oral & Maxillofacial Surgery Position Statement

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It is intended to be a resource for practitioners in all specialties of dentistry and medicine, as well as patients, industry, and other interested parties.

This reference guide is not intended to be a standard of care or an absolute/definitive algorithm for either prevention or treatment but rather only an informational document for the reader to devise individual management or treatment plans to optimize patient care on a case by case basis. As already stated these guidelines represents the best independent evidence and experience related to DIONJ at the time of its development. Most assuredly new data and new drugs will come about that may modify and add to these guidelines. The Division of Oral and Maxillofacial Surgery at the University Of Miami Miller School Of Medicine or its authors make no expressed or implied warranty regarding the content, accuracy, completeness, reliability, probability or legality of the information continued within this statement/reference guidelines. This includes without limitation, the warranties of merchantability, fitness for any particular purpose and non-infringements or proprietary rights. However, the authors attest that no conflict of interest exists and that no outside industrial, legal or academic interests influenced the clinical science contained in the this paper. In no event shall the University of Miami or the authors be liable to the reader or user of this position statement/ reference guidelines or anyone else for any decision made or action taken by him or her in reliance in such information.
Drug Induced Osteonecrosis of the Jaws

Exposed non-healing bone in the mandible or maxilla that persists for more than eight weeks in a person who received a systemic drug known to cause ONJ but who has not received local radiation to the jaws.

ICD-10 Code

M87.180 Drug Induced Osteonecrosis

DIONJ Staging

Stage O:
- Radiographic evidence of bisphosphonate toxicity

Stage I:
- Exposed bone limited to one quadrant

Stage II:
- Exposed bone involving two quadrants

Stage III:
- Exposed bone involving three or four quadrants
- Osteolysis/Extension to Inferior Border of Mandible
- Pathologic Fracture
- Extension into Maxillary Sinus or Nasal Cavity
### OFFENDING DRUGS

**Decreasing Risks of Drug Induced Osteonecrosis of the Jaws (DIONJ)**  
Adapted from the University of Miami Division of Oral & Maxillofacial Surgery Position Statement

#### Osteoporosis Drugs

<table>
<thead>
<tr>
<th>Drug</th>
<th>Classification</th>
<th>Action</th>
<th>Dose</th>
<th>Route</th>
<th>% of Reported Cases *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alendronate (Fosamax Generic)</td>
<td>Bisphosphonate</td>
<td>Osteoclast Toxicity</td>
<td>70 mg/wk</td>
<td>Oral</td>
<td>82%</td>
</tr>
<tr>
<td>Residronate (Actonel Atelvia)</td>
<td>Bisphosphonate</td>
<td>Osteoclast Toxicity</td>
<td>35 mg/wk</td>
<td>Oral</td>
<td>1%</td>
</tr>
<tr>
<td>Ibandronate (Boniva)</td>
<td>Bisphosphonate</td>
<td>Osteoclast Toxicity</td>
<td>150 mg/mos</td>
<td>Oral</td>
<td>1%</td>
</tr>
<tr>
<td>Zoledronate (Reclast)</td>
<td>Bisphosphonate</td>
<td>Osteoclast Toxicity</td>
<td>5 mg/yr</td>
<td>IV</td>
<td>6%</td>
</tr>
<tr>
<td>Denosumab (Prolia)</td>
<td>Monoclonal Antibody</td>
<td>Osteoclast Impairment</td>
<td>60 mg/6 mos</td>
<td>Subcutaneous</td>
<td>10%</td>
</tr>
</tbody>
</table>

#### Drugs in Treatment of Cancer, Complications, and Metastasis

<table>
<thead>
<tr>
<th>Drug</th>
<th>Classification</th>
<th>Action</th>
<th>Dose</th>
<th>Route</th>
<th>% of Reported Cases *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zoledronate (Zometa)</td>
<td>Bisphosphonate</td>
<td>Osteoclast Toxicity</td>
<td>4 mg/mo</td>
<td>IV</td>
<td>67%</td>
</tr>
<tr>
<td>Pamidronate (Aredia)</td>
<td>Bisphosphonate</td>
<td>Osteoclast Toxicity</td>
<td>90 mg/mo</td>
<td>IV</td>
<td>18%</td>
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<tr>
<td>Bevacizumab (Avastin)</td>
<td>Monoclonal Antibody</td>
<td>VEGF Inhibitor</td>
<td>100-400 mg/14 days</td>
<td>IV</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Sunitinib (Sutent)</td>
<td>Tyrosine Kinase Inhibitor</td>
<td>Osteoclast Toxicity</td>
<td>5 mg/yr</td>
<td>IV</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Denosumab (Xgeva)</td>
<td>Monoclonal Antibody</td>
<td>Osteoclast Inhibitor</td>
<td>120 mg/mo</td>
<td>Subcutaneous</td>
<td>15%</td>
</tr>
</tbody>
</table>

*Data from University of Miami Division of Oral and Maxillofacial Surgery as of July 1, 2016.

** Percentages are anticipated to change as the newer drugs are more frequently used.
**Bisphosphonates**
- Cause osteoclast death at resorption sites
- Cause osteoclast precursor inhibition and death in bone marrow
- Half-Life= 11+ years in bone

**Denosumab (Xgeva or Prolia)**
- Osteoclast inhibition at resorption sites
- Osteoclast inhibition in blood and tissue spaces
- Osteoclast precursor inhibition in bone marrow
- Half-Life= 26 days in bone

**Bevacizumab (Avastin)**
- Blocks Action of VEGF in normal cells and cancer cells
- Half-Life= 50 days in bone

**Sunitib (Sutent)**
- Blocks action of multiple Growth Factors (VEGF, PDGF, TGF-b, etc)
- Half-Life= 4.6 days in bone

**Risk Factors**
- Increased Dose (Fosamax vs. Boniva)
- Increased Potency (Oral vs. IV)
- Increased Frequency (Weekly vs Monthly vs Yearly)
- Half-Life (in bone)
- Duration of Use/Exposure

**Initiating Factors**
- Extractions
- Spontaneous
- Traumatic Occlusion
- Alveolar Surgery (Implants, Periodontal, Apicoectomy)

**Vulnerable Sites**
- Alveolar Bone
- Tori
- Mandible >Maxilla 2:1
- Lingual Cortex

**Co-Morbidities**
*Comorbidities Do Not Cause ONJ-
But they do make the ONJ Occur Sooner, More Severe, and More Extensive*
- ***Other Drugs (Chemotherapy, Methotrexate, Steroids)***
- Diabetes
- Smoking
- Cancer
- Periodontitis,
Indications for the Serum CTX Test

- Patients on Oral or IV Bisphosphonates for Osteoporosis.
  - Those with 2+ years of Bisphosphonate Treatment (with additional comorbidities)
  - Those with 3+ years of Bisphosphonate Treatment (without additional comorbidities)
- Guide Treatment Decisions
  - Determination of Need for Drug Holiday Prior to Surgery
  - Monitoring Bone Turn-Over Improvement Drug Holiday
- Results $\geq 151$ pg/ml = generally safe to proceed with surgery

How to Order Serum CTX Test

- CTX (Collagen Type 1 C-Terminal Telopeptide)
- AM Fasting Serum Draw
- Report Results in pg/mL
- Please Fax Results to: xxx-xxx-xxxx
- ICD-10 Dx Code:
  - M87.180 Drug Induced Osteonecrosis (use this code when there is evidence of exposed bone)
  - Z03.6 Disorder of Bone Unspecified (use this code for screening/pre-op evaluation when there is no evidence of exposed bone)
- CPT Code: 82523
- Quest Lab Test Reference Code: 17406
- LabCorp Test Reference Code: 500089

Guiding Treatment Decisions with CTX

The Serum C-Terminal Telopeptide CTX Can Predict Risk Related To Oral Bisphosphonates

<table>
<thead>
<tr>
<th>CTX</th>
<th>Risk Level</th>
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<tbody>
<tr>
<td>$\leq 100$ pg/ml</td>
<td>high risk</td>
</tr>
<tr>
<td>101 to 150 pg/ml</td>
<td>moderate risk</td>
</tr>
<tr>
<td>$\geq 151$ pg/ml</td>
<td>little or no risk</td>
</tr>
</tbody>
</table>

CTX values improve significantly with discontinuance of the oral bisphosphonates

CTX Limitations

- **Active Cancer Patients** - (Patients with Metastatic Cancer, Multiple Myeloma- being treated with IV Bisphosphonates) show False High CTX results.
- **Methotrexate Patients** - CTX results remain too low
- **Systemic Steroid Patients** - CTX results remain too low
- **8+ years of Bisphosphonates** - CTX results will first rise and then decrease again.

A 9-12 Month Drug Holiday is used instead to guide treatment decision and timing of surgery.
OSTEOPOROSIS PATIENTS (Oral Bisphosphonates / IV Reclast / S.C. Denosumab)
Recommendations BEFORE Initiating Drug Therapy

Dental/OMFS Examination
- Prophylaxis/Dental Hygiene/Periodontal Treatment
- Caries Control
- Endodontic Therapy / Crown & Bridge
- Fluoride Carriers / Rx Fluoride Toothpaste
- Lighten Excessive/Heavy Occlusal Contacts (Balanced Occlusion)
- Extraction of Non-Salvageable/Hopeless Teeth
- Selective Removal of Excessively Large/Multi-Lobulated Tori

***Non Surgical Restorative/General Dental Care Is Safe At All Times****

Oral Bisphosphonate
(Fosamax, Actonel, Boniva, etc)
DIONJ Risk Increases Between 2-3 Years of Use

**Keep In Mind Many Patients May Have Been On Oral Bisphosphonate Before**

IV Bisphosphonate
(Reclast/Zolendronate)
DIONJ Risk Increases By 4th Dose

If Elective Dental Treatments (Including Extractions, Periodontal Surgery, Dental Implants) Are Completed 3-6 Months Before Reaching These Risk Thresholds, Routine Wound Healing & Osseointegration Is To Be Expected

S.C. RANK-L Inhibitor
(Prolia/Denosumab)
DIONJ Risk Increases After 2 Doses

**Keep In Mind Many Patients May Have Been On Oral Bisphosphonate Before**
OSTEOPOROSIS PATIENTS (Oral Bisphosphonates / IV Reclast / S.C. Denosumab)
Recommendations DURING Drug Therapy

HISTORY OF ORAL BISPHOSPHONATES For Osteoporosis

Less Than 2 Years
- 2+ Years with Additional Risk Factors/Co-Morbidities
- 3+ Years without Additional Risk Factors/Co-Morbidities

CTX Test

CTX Test <150pg/ml
- 9 Month Drug Holiday
- Conservative Management
  - Antibiotics
  - Peridex
  - Root-Canal Therapy
  - Amputate Crown

Repeat CTX Test <150pg/ml
- Proceed to Surgery
  - No Elective Surgery
  - Extend Drug Holiday Monitor CTX Consider Alternative Treatment Strategies

CTX Test ≥150pg/ml
- Proceed to Surgery
  - No Elective Surgery
  - May Restart Bisphosphonates After 3 Months Healing

HISTORY OF IV BISPHOSPHONATES For Osteoporosis

IV Reclast < 3 Doses
- 9 Month Drug Holiday From Last Dose
- If Previous Oral Bisphosphonate Tx Use 12+ Month Drug Holiday
- Consider CTX to help guide decision making and treatment timing

CTX Test

CTX Test <150pg/ml
- Proceed to Surgery
  - No Elective Surgery
  - Extend Drug Holiday Monitor CTX Consider Alternative Treatment Strategies

CTX Test ≥150pg/ml
- Proceed to Surgery
  - No Elective Surgery
  - May Restart Bisphosphonate After 3 Months Healing

HISTORY OF S.C. DENOSUMAB For Osteoporosis

S.C. Prolia < 2 Doses
- 3 Month Drug Holiday From Last Dose
- If Previous Oral Bisphosphonate Tx 9-12+ Month Drug Holiday
- CTX Guidelines Not Well Established

CTX Test

CTX Test <150pg/ml
- Proceed to Surgery
  - No Elective Surgery
  - Extend Drug Holiday Monitor CTX Consider Alternative Treatment Strategies

CTX Test ≥150pg/ml
- Proceed to Surgery
  - No Elective Surgery
  - May Restart Denosumab After 3 Months Healing

Repeat CTX Test ≥150pg/ml
- Proceed to Surgery
  - No Elective Surgery
  - May Restart Denosumab After 3 Months Healing

Repeat CTX Test <150pg/ml
- Proceed to Surgery
  - No Elective Surgery
  - May Restart Denosumab After 3 Months Healing
OSTEOPOROSIS PATIENTS (Oral Bisphosphonates / IV Reclast/ S.C. Denosumab) Management of Exposed Bone / DIONJ

**50% of Patients**
- Spontaneous Resolution of DIONJ

**40% of Patients**
- Require Alveolar Debridement or Local Alveolar Resection to Achieve Resolution of DIONJ

**10% of Patients**
- Require Aggressive Surgical Management to Achieve Resolution of DIONJ
  - Mandible
    - Continuity Resection
    - Titanium Reconstruction Plate
  - Maxilla
    - Submucosal Resection / Antrostomy/Radical Sinusotomy
    - 2 Layer Closure-Buccal Fat Pad Reconstruction with Mucosal Advancement Flap

**Drug Holiday**
- Oral & IV Bisphosphonates- 9 Months
- SC Denosumab- 3 Months

**Initial Conservative Management**
- Avoid Debridements / Invasive Surgical Procedures
- OK to Smooth Sharp Edges For Patient Comfort
- Pain is Related to Secondary Infection - Treat With Antibiotics & Antimicrobials:
  - Chlorhexidine (0.12%) Rinse
  - Penicillin VK 500mg- 1 tab po q6h x 14 days
  - Doxycycline 100mg - 1 tab po q day x 14 days
- Refractory Cases add :
  - Flagyl 500mg- 1 tab po TID x 10 days
- Consider Antifungal Treatment
  - Mycelex Troches
  - Nystatin Rinse

**50% of Patients**

**40% of Patients**

**10% of Patients**

**Mandible**
Continuity Resection
Titanium Reconstruction Plate

**Maxilla**
Submucosal Resection / Antrostomy/Radical Sinusotomy
2 Layer Closure
Buccal Fat Pad Reconstruction with Mucosal Advancement Flap

**Adjunctive Growth / Healing Factors**
- PRP- Platelet Rich Plasma
- PRF- Platelet Rich Fibrin

**Future bone-graft reconstruction may be considered**
CANCER PATIENTS (IV Bisphosphonates / S.C. Denosumab)

Recommendations BEFORE Initiating Drug Therapy

- Dental/OMFS Examination
- Prophylaxis/Dental Hygiene/Periodontal Treatment
- Caries Control
- Endodontic Therapy / Crown & Bridge
- Fluoride Carriers / Rx Fluoride Toothpaste
- Lighten Excessive/Heavy Occlusal Contacts (Balanced Occlusion)

***Non Surgical Restorative/General Dental Care May Continue Up To & After Initiation of Drug Therapy***

- Extractions of Non-Restorable Teeth, Teeth With Poor Prognosis
- Alveoloplasty & Smooth Of Sharp Bone Edges
- Primary Closure

- Selective Removal of Tori & Exostoses (Excessively Large/Multi-Lobulated)

***2 Months Healing Before Commencing IV Bisphosphonates/ SC Denosumab Is Preferred If Possible/Agreed Upon By Medical Oncologist. However, Timely Cancer Treatment Remains Greater Priority***

- Risk Factors Increase By 4th Dose of IV Bisphosphonate or 2nd Dose of SC Denosumab-
- So Treatment May Still Be Initiated & Completed Within This 2-4 Month Window
CANCER PATIENTS (IV Bisphosphonates / S.C. Denosumab)
Recommendations DURING Drug Therapy

**Elective Extractions & Periodontal Surgery Contraindicated**
- After 4th Dose of IV Bisphosphonate
- After 2nd Dose S.C. Denosumab

**Dental/OMFS Examination**
- Prophylaxis/Dental Hygiene/Supragingival Scaling
- Caries Control
- Endodontic Therapy / Crown & Bridge
- Fluoride Carriers / Rx Fluoride Toothpaste
- Splint Mobile Teeth
- Exercise Caution When Taking Intraoral Radiographs & Using Rubber-Dam Clamps To Avoid Traumatizing Mucosal Tissues
- ***Non Surgical Restorative/General Dental Care Is Safe***

**Drug Holiday & Conservative Non-Surgical Management Is Preferred**
- Antibiotics & Chlorhexidine Rinse To Manage Pain and Infection
- Non-Restorable Tooth- Consider Root Canal Therapy with Amputation of Crown (Leaving Roots in Place)
- Incision & Drainage

**Medically Necessary / Emergent Conditions Not Amenable to Drug Holiday and/or Conservative Measures**
- Informed Consent / Proceed to Surgery (Atraumatic/Minimally-Invasive)
- Consider Use of Adjunctive Growth/Healing Factors (PRP or PRF)
- Monitor Healing Closely

**Elective Dental Implant Surgery Contraindicated**
- After 4th Dose of IV Bisphosphonate
- After 2nd Dose S.C. Denosumab
CANCER PATIENTS  IV Bisphosphonates / S.C. Denosumab
Management of Exposed Bone / DIONJ

60% of Patients Can Be Managed to Achieve Pain-Free / Infection-Free State With Continued Exposed Bone (No Surgery Required)

**Initial / Long-Term Conservative Management**
- Avoid Debridements /Invasive Surgical Procedures
- OK to Smooth Sharp Edges
- Pain is Related to Secondary Infection- Treat With Antibiotics & Antimicrobials:
  - Chlorhexidine (0.12%) Rinse
  - Penicillin VK 500mg- 1 tab po q6h x 14 days
  - Doxycycline 100mg - 1 tab po q day x 14 days
- Refractory Cases add:
  - Flagyl 500mg- 1 tab po TID x 10 days
- Consider Antifungal Treatment
  - Mycelex Troches
  - Nystatin Rinse

**40% of Patients Require Surgical Intervention**

**IF SURGERY IS UNAVOIDABLE**
(Severe Chronic/Refractory Infections, Oral-Cutaneous Fistula, Pathologic Fracture, Stage III DIONJ)
Medical Oncologist Consult for Possible Drug Holiday With Close Cancer Monitoring

**SURGICAL INTERVENTION**

**Mandible**
- Alveolectomy
- Continuity Resection
- Titanium Reconstruction Plate

**Posterior Maxilla**
- Alveolectomy/Submucosal Resection / Antrostomy/Radical Sinusotomy
- 2 Layer Closure- Buccal Fat Pad Reconstruction with Mucosal Advancement Flap

**Anterior Maxilla**
- Alveolectomy/Submucosal Resection
- Nasal Floor Involvement Requiring Resection (Generally Not Necessary)

**Bone-Graft Reconstruction**
- Generally Not Feasible

**Soft-Tissue Reconstruction**
- Pedicled Myocutaneous or Microvascular Free-Flap may be used if necessary

**Adjunctive Growth / Healing Factors**
- PRP- Platelet Rich Plasma
- PRF- Platelet Rich Fibrin

**Pre-Op Drug Holiday**
IV Bisphosphonates- 9 Months
SC Denosumab- 3 Months

**Post-Op Drug Holiday**
3 Months

**RESOLUTION of DIONJ**
DIONJ Pharmacological Treatment Options

ANTIMICROBIAL RINSE
- Chlorhexidine 0.12% - Swish/Spit 15ml TID

PRIMARY ANTIBIOTIC CHOICES
- Penicillin VK 500mg PO q6h x 14 days
- Doxycycline 100mg po qday x 14 days (Antibiotic of choice in Penicillin Allergic Patients)
- Add Flagyl 500mg PO q8h x 10 days for refractory cases

SECONDARY ANTIBIOTIC CHOICES
- Levaquin 500mg po q day x 7 days & Flagyl 500mg PO q8h x 10 days, (Extended Courses of Levaquin- Risk of Tendon Rupture)
- Erythromycin 400mg PO q8h x 7 days & Flagyl 500mg PO q8h x 10 days
- Ciproflaxacin 500mg PO q12h x 7 days, & Flagyl 500mg PO q8h x 10 days
- Unasyn 1.5g IV q6h & Flagyl 500mg IV q8h for hospitalization

MOST COMMON MICROBIAL ORGANISMS
- Actinomyces
- Veillonella
- Eikenella
- Moraxella

LONG TERM ANTIBIOTICS
- Penicillin VK and Doxycycline are acceptable long-term options with low side effects

INEFFECTIVE ANTIBIOTICS
- Clindamycin

INEFFECTIVE THERAPIES FOR DIONJ
- Ozone Treatment
- Hyperbaric Oxygen
- Laser Treatment
- Pentoxifyline
Decreasing Risks of Drug Induced Osteonecrosis of the Jaws (DIONJ) 
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### Oral Bisphosphonates for Osteoporosis:
- Risk of DIONJ Significantly Increases after 2-3 years of treatment
- Surgical procedures may be safely performed if:
  - CTX > 151pg/ml
  - 9 Month Drug Holiday pre-op
  - 3 Month Drug Holiday post-op
- Dental implants are possible if placed and permitted to osseointegrate in accordance with Drug Holiday and/or CTX Guidelines
- Beware that patients with 8+ years of bisphosphonate history (as CTX results first rise and then drop again, meaning a longer drug holiday may be necessary).
- Consider use of growth/healing factors (PRP or PRF)

### IV Bisphosphonate (Reclast/Zolendronate) for Osteoporosis:
- Risk of DIONJ Significantly Increases by 4th dose
- Invasive surgical procedures are preferably avoided, with strong consideration for alternative procedures such as root canal therapy, or other conservative non-surgical management.
- If surgical intervention is necessary:
  - CTX > 151pg/ml
  - 9 Month Drug Holiday pre-op
  - 3 Month Drug Holiday post-op
- Dental Implants may be considered if placed and osseointegrated in accordance with Drug Holiday and/or CTX Guidelines prior to receiving 4th dose.
- Keep in mind that many patients have previously been on an oral bisphosphonate, and therefore DIONJ RISK IS SIGNIFICANTLY HIGHER. A longer drug holiday is indicated. Consider CTX guidance in decision making/timing.
- Consider use of growth/healing factors (PRP or PRF)

### Sub Cutaneous Injection of RANK-L Inhibitor Prolia (Denosumab) for Osteoporosis:
- Risk increases after 2 Doses
  - CTX guidelines not well/fully established at present time.
  - 3 Month Drug Holiday pre-op
  - 3 Month Drug Holiday post-op
- Keep in mind that many patients have previously been on an oral bisphosphonate, and therefore DIONJ RISK IS SIGNIFICANTLY HIGHER. A longer drug holiday is indicated. May consider possible CTX guidance in decision making/timing.
- Consider use of growth/healing factors (PRP or PRF)

### IV Bisphosphonate (Zometa/Zolendronic Acid, Aredia/Pamidronate) for Metastatic Cancer:
- Risk of DIONJ Significantly Increases by 4th dose
- Invasive surgical procedures are preferably avoided, with strong consideration for alternative procedures such as root canal therapy, or other conservative non-surgical management.
- If surgical intervention is necessary:
  - 9 Month Drug Holiday pre-op
  - 3 Month Drug Holiday post-op
  - During Drug Holiday- close monitoring of cancer by Medical Oncologist
- CTX NOT Useful or Indicated in Cancer Patients
- Consider use of growth/healing factors (PRP or PRF)

### Sub Cutaneous Injection of RANK-L Inhibitor Xgeva (Denosumab) for Metastatic Cancer:
- Risk of DIONJ increases after 2 Doses
- Invasive surgical procedures are preferably avoided, with strong consideration for alternative procedures such as root canal therapy, or other conservative non-surgical management.
- If surgical intervention is necessary:
  - 3 Month Drug Holiday pre-op
  - 3 Month Drug Holiday post-op
  - During Drug Holiday- close monitoring of cancer by Medical Oncologist
- Keep in mind that many patients previously been on an IV Bisphosphonate and therefore DIONJ RISK IS SIGNIFICANTLY HIGHER. A longer drug holiday (9-12+ months) is indicated
- CTX NOT Useful or Indicated in Cancer Patients
- Consider use of growth/healing factors (PRP or PRF)

### IV VEGF Inhibitor (Bevacizumab / Avastin)
- Too few cases exist for guidelines at present time
- Informed consent and proceed with caution
- Consider use of growth/healing factors (PRP or PRF)

### IV Tyrosine Kinase Inhibitor (Sutinib / Sutent)
- Too few cases exist for guidelines at present time
- Informed consent and proceed with caution
- Consider use of growth/healing factors (PRP or PRF)
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**Drug Holiday**
- Safe and Effective
- Should be initiated by the prescribing physician
- Allows for sufficient repopulation of functional osteoclasts to aid in healing
- Should extend for 3 months postoperatively to permit sufficient healing

**Alternatives to Anti-Resorptive Medications for Osteoporosis (No Mechanism or Risk of DIONJ)**
- Calcium & Vitamin D3
- Raloxifene (Evista)
- rhPTH1-34 (Forteo)

**Effects Of Continuing Or Stopping Alendronate After 5 Years Of Tx**

**Conclusions:** Women who discontinued alendronate after 5 years showed a moderate decline in BMD and a gradual rise in biochemical markers but no higher fracture risk other than for clinical vertebral fractures compared with those who continued alendronate. These results suggest that for many women, discontinuation of alendronate for up to 5 years does not appear to significantly increase fracture risk. However, women at very high risk of clinical vertebral fractures may benefit by continuing beyond 5 years.

**JAMA Editorial- Alendronate: “Five Years of a good thing is enough**
Colon-Emeric CS. JAMA. 2006 Dec 27;296(24):2968-9

**FDA Statement, September 2011**
September 9, 2011: Joint Meeting of the Reproductive Health Drugs Advisory Committee and the Drug Safety and Risk Management Advisory Committee Meeting Announcement
- Every woman on bisphosphonates for osteoporosis must be re-examined after 3 years
- Nobody needs to take bisphosphonates for osteoporosis for more than 5 years

**Oral Bisphosphonate With “Lowest Risk” of DIONJ**
- Boniva (Ibandronate)