Arthrex Quickset™
Injectable Macroporous Calcium Phosphate
1. Background
2. Features and benefits
3. Surgical technique
4. Pre-clinical and clinical work
5. Applications
Synthetic BVFs

• **Advantages**
  – Low morbidity to patient
    • Don’t need to obtain autograft from 2\textsuperscript{nd} site
  – Pure osteoconductive graft
    • Calcium deficient apatite
      – Serve as binding sites for osteoblasts
      – Provide nutrition for osteoblasts during repair process
    • Can provide increased strength compared to cancellous bone
      • Longer retention time before resorption
  – Longer shelf life than DBM
  – No risk of disease transmission
Synthetic BVFs

• **Potential Disadvantages**
  - Lack of true osteoinductivity
  - Some materials will resorb too quickly
  - Some materials will not resorb at all
  - Low porosity leads to inadequate resorption
  - Preparation may be time-consuming in OR
## Synthetic BVFs

<table>
<thead>
<tr>
<th></th>
<th>Calcium Phosphates (Including TCP)</th>
<th>Hydroxyapatite Calcium Phosphates</th>
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</thead>
<tbody>
<tr>
<td><strong>Calcium Sulfate</strong></td>
<td>Resorbs too quick</td>
<td>Minimal resorption</td>
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<td>Will dissolve irrespective of new bone formation¹</td>
<td>Osteoid formation can be limited to the periphery</td>
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<td>Osteoid forms directly on surface w/o soft tissue interposition</td>
<td>Porosity is key to having optimal results</td>
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<td>Reported complications of serous drainage until fully resorbed²</td>
<td>Material tends to have an inherent brittle behavior³</td>
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When reviewing synthetic BVFs, ask the following questions:

- What is the material made of?
  - Does the material provide optimal resorption?
- Does the material have adequate porosity?
- Is the mixing/delivery system user-friendly?
- Will the material stay contained?
- Does the material crystallize/harden?
Arthrex Quickset

- Injectable Macroporous Calcium Phosphate
- Composition
  - Easy-to-use, closed, dual chambered mixing system
  - Powder phase
    - Mixture of calcium phosphates
    - Organic, biocompatible, polysaccharide polymer
  - Liquid phase
    - Sodium phosphate solution
  - End product after crystallization
    - Calcium-deficient apatite
    - Very similar to mineral phase of bone
• **Global porosity = 70%**
  – Microporosity (<10 µm): 88%
    • Improves bone ingrowth due to increased permeability and surface for attachment of osteoblasts¹,²
  – Mesoporosity (10-100 µm): 2%
  – Macroporosity (>100 µm): 10%
    • Interconnected macroporosity is a strict requirement for bone ingrowth; pores greater than 100 allow for osteogenic cells and vessels to penetrate the cement¹,³
    • Macroporosity without microporosity leads to decreased bone ingrowth compared to a combination of macro and micro⁴
  – Porosity occurs by the time it reaches complete crystallization/hardening

• Physical and Chemical Properties
  – Mechanical compressive strength = 24 MPa
    • Cancellous bone compressive strength = 10-15 MPa
  – Excellent cohesiveness, prevents wash-out
  – Crystallization does not cause shrinkage
  – Non-exothermic reaction
  – Radio-opaque
**Arthrex Quickset**

- **Preparation**
  - Mixing time (room temp): 2 min
  - Injection time (room temp): 2 min
  - Initial setting time (body temp): 8 min
  - Time it takes to begin firming up (not hard at this point)
  - Complete crystallization/hardening (body temp): 24 hours

**NOTE:** Manipulation after implanting not recommended; can affect crystallization and strength
Crystallization Process

- α-TCP dissolution
- CDA precipitation
- $\text{H}_2\text{O}$

½ hour after setting

α-TCP particle

1 µm

7 days after setting

1 µm
Components

- 7 G Cannula (Luer Connection)
- Dispenser Piston
- Keyed Syringe Slot
- Release Lever
- Trigger
- Handle
- Mixing Element
- Sodium Phosphate Liquid
- Calcium Phosphate Powder
- Pushrod
- Rotating Collar with three settings: Closed, Transfer, Inject

Arthrex Quickset is available in the U.S. as a convenience kit containing Arthrex Quickset, cannula and a delivering gun.
Surgical Technique

1. 
2. 
3. 
4. 
5. 
6.
Surgical Technique

Optional Use Without Delivering Gun

7

8
Pre-clinical Study

Rabbit critical defects filled with bone cement

Quickset Predicate

Norian

Macroporous

Dense
Pre-clinical Study

Rabbit critical defects filled with bone cement

Quickset Predicate

Porous

Macroporous

Porosity Leads to New Bone Formation
Pre-clinical Study

Rabbit critical defects filled with bone cement

Quickset Predicate

Macroporous

Porosity Leads to New Bone Formation
Pre-clinical Study

Rabbit critical defects filled with bone cement – 4 weeks
Clinical Case Report

Complex tibial plateau fracture

Tx: ORIF with Quickset

Surgery performed by Sébastien Parratte, MD, PhD
Ste Marguerite University Hospital, Marseille, France
Clinical Case Report

4 months – wires and screw removed, biopsy taken, intertwining network of new bone formation
Clinical Case Report

8 months – fracture healing with good osteointegration of Quickset
Clinical Case Report

20 months – biopsy showing minimal residual biomaterial, mineralized lamellar bone
Clinical Applications

• Upper Extremity
  – Clavicle fx
  – Revision TSA
  – Proximal humerus fx
  – Benign bone cyst
  – Distal radius fx
Clinical Applications

- Lower Extremity
  - Revision THA
  - Core decompression for AVN
  - Periprosthetic fx
  - Distal femur fx
  - Revision TKA
  - Revision ACL
  - Tibial plateau fx
  - Pilon fx
  - Calcaneus fx
Arthrex Quickset

• Key benefits
  – Easy-to-use, closed mixing system
  – Able to be injected
  – Porosity (Macro and Micro)
    • Cellular penetration throughout implant
    • Resorption and substitution with healthy bone
  – Crystallizes/hardens
  – Doesn’t shrink and isn’t exothermic
  – Cohesive nature

1. Results in lower prevalence in loss of fracture reduction compared to autograft
2. Less pain at fracture site compared to controls managed with no graft
Questions?

Contact your Arthrex representative