The View from Marblehead to Boston
A 2020 View* of MSK Interventions

*refers to the year, not the clarity

It was the best of times, it was the worst of times
It was the age of wisdom, it was the age of foolishness.

A Tale of Two Cities - Charles Dickens

Daniel Rosenthal, MD
MGH
October 2011
The best of times...

Demographics
Technology
Biology/Genetics
Informatics

Sixty minutes of thinking of any kind is bound to lead to confusion and unhappiness
---James Thurber
Interventional Radiology is a development of our professional lifetimes.

It grew out of vascular and cardiac catheterization.

Therapeutics pioneered by Dotter.
- January 16, 1964 1st angioplasty

“Interventional Radiology” term coined by Alexander Margulis March 1967
Subspecialization introduced to MGH by Juan Taveras early 1970s

Among the earliest MSK procedures was “distention arthrography”

When Susan Kattapuram and I arrived at MGH (1978) the only MSK intervention that was performed was arthrography and joint aspiration

Needle biopsies of bone were done by only 1 orthopedic surgeon. Spine biopsies were limited to T10 and below!
## Current Offerings

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<th>Arthrograms</th>
<th>Vertebroplasty</th>
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The Future looks bright because: The population is aging!!

- **Osteoporosis**
  - Half of people >50 may have osteoporosis related fractures over the next 13 years. [Surgeon Generals report 2005]

- **Arthritis**
  - ? unintended consequence of efforts to avoid cardiovascular disease
  - ↑ Sport-related injuries
Hardware continues to improve:

- Increased image acquisition speed (especially CT)
- 3D guidance is possible in (almost) real-time
- This permits further technical developments, and also increases confidence of the operator.
There will be Robots!
Unfortunately, our clinical colleagues are ahead of us
A pig undergoes robotic surgery

“Robopsy”

Earlier, More Precise & Faster CT-guided Procedures

www.robopsy.com
Procedures that will benefit from robotics

- Multiple soft tissue needle placements
  - Lung metastases
  - Brachytherapy

- However:
  - Deviations of the needle due to uneven tissue composition are a major source of guidance error
  - Bone procedures will be among the last to become robotic
  - “Semi-active” robotics- guidance only
There will be new procedures!

- Percutaneous soft tissue release
  - Epicondylitis
  - Plantar fasciitis
  - Capsulitis
- Percutaneous Fixation
- Percutaneous Resection and ablation
There will be more Fracture fixations By Radiologists!
Percutaneous sacroplasty with the use of C-arm flat-panel detector CT: technical feasibility and clinical outcome.

Closed reduction with CT-guided screw fixation for unstable sacroiliac joint fracture-dislocation
Baskin, KM//Cahil, AM//Kaye, RD//Born, CT//Grduziak, JS//Towbin RB Pediatric Radiology Dec 2004
Injectable Biologicals will enhance healing!

- Bone substitutes
  - Biological
  - Non-biological polymers
- A real cement will become available!
- Osteoinductive materials (BMP)
  - Implantation on carriers such as bone substitutes
  - Direct Injection
    - (Gene therapy)

Implantation will remain the realm of orthopedics, but injection....?
Percutaneous Spine Fusion
from Amar et al Neurosurg Clin N Am 2005  561-568

Injectable, inflated rods
There will be new modalities for tissue Ablation!

- Embolization
  - Physical
  - Chemical
- Radiofrequency
  - "Coblation"
- Cryoablation
- IDET
- Irreversible electroporation
- MRI-guided focused ultrasound
- Oxygen-ozone ablation
  - Not approved in US but promising in Europe
The near-future should be a good time for MSK interventions

BUT WE MUST...

Beware the corrosive effects of money!
Keep pace with changing expectations and regulations!
Be prepared for turf issues!

Professional meetings are important because they demonstrate how many people a department can do without.
Money Drives Change

- U.S. Payment policies provide incentive to perform more expensive procedures
  - Vacuum-assisted Breast biopsy
- Coverage is typically partial (at best), leaving remainder to patient
- Self referral
  - “The cost conundrum—what a Texas town can teach us about health care” Atul Gawande, New Yorker, August 10, 2009
Reasons for the rapid growth of Vertebroplasty/Kyphoplasty

AP Amar et al Neurosurg Clin N am 2005

1. Aggressive marketing campaigns
2. Recent technical innovations and instrumentation enhancements (e.g., kyphoplasty)
3. The enfranchisement of neurosurgeons, orthopedic surgeons, and other nonradiologist practitioners
4. The growing number of neurosurgeons with hybrid training in INR techniques
5. An ever-aging population with commensurate increases in the incidence of osteoporotic spinal compression fractures
6. The pervasive trend toward therapeutic minimalism
Beware the Bizarre, Untested, Trivial !!

- **Radiance™**: Calcium hydroxyapatite tissue enhancer

Specialists are people who always repeat the same mistakes.
Walter Gropius
Platelet Rich Plasma Injections

- Enhancement of the wound healing cascade by injected autologous growth factors
  - Plantar fasciitis
  - Lateral epicondylitis
  - Muscle injury

- Objective evidence of beneficial effect in animals, but very limited in human data.
Platelet Rich Plasma Injections

One would draw the patient's blood in a sterile fashion, using a syringe as shown above, and spin the blood down using the platelet rich plasma kit in order to produce only the platelet rich material for injection.
There will be confusion!!
There will be changes in our job description and expectations!!

- Increased surveillance of safety and appropriateness
- Procedure-specific credentials
- Radiologists as primary caregiver:
  - Pre and post procedure evaluation
  - Record keeping
- MOC

There will be new systems for managing these requirements
There will be increasingly complex procedure guidance

- Maps for overlapping ablation
- Cell proliferation imaging using thymidine
- Temperature imaging
- Navigation systems
- Contrast agents with long intravascular dwell time

Interventional Radiologists will become more like “Clinicians”

“...if we don’t assume clinical responsibility for our patients, we will face forfeiture of our territorial rights based solely on imaging equipment others can obtain and skills other can learn.”

-DOTTER, C.T. FORTSCHR RONTGENSTR 1968
Some clinicians will become more like Radiologists

Editorial

SHOULD NEUROSURGEONS BECOME INTERVENTIONAL NEURORADIologists?

The short answer to this question is “yes.” But not the way it is being done in many institutions in the United States. A few years ago, I wrote an editorial predicting that coiling of aneurysms would become a prominent treatment for intracranial aneurysms [1], which prompted criticism from neurosurgeons at several institutions. Now, aneurysms are being coiled at these very institutions.

The problem with a correlative is that they can, and become leaders in their development. The promise of the future of medicine is phenomenal.

So, should a neurosurgeon become an interventional neuroradiologist? Yes. But so should an interventional neuroradiologist. To be in the forefront of this field, you will have to work 24 hours a day, 7 days a week. Entering the field simply to keep others out or to keep all the potential income is futile; become a neurosurgeon and make things happen.

James I Ausman MD PhD
It’s so easy, even a child can do it
Department boundaries will blur!

- Economics will force shared facilities

Radiology

Image interpretation

Intervention

Minimally invasive

Operative
There will be “turf” battles!

- **2000:**
  - “Close cooperation between trauma surgeons and radiologists and careful selection of cases *(for surgeon)* is mandatory.”

- **2001**
  - “Localization with CT guidance was performed by the radiologist using 3-D images followed by percutaneous screw placement by the orthopaedic surgeon.”

- **2007**
  - “CT-guided iliosacral screw placement is a safe and accurate procedure that can be performed by radiologists in a radiology suite.”
Strategies that do not work

- exclusive contracts
- credentials documents
- practice standards
- optimal imaging environment
- control of equipment.

Strategies that do work

- Active clinical involvement
- relationship with hospital administration
- creative partnerships
- revenue sharing

To the extent that equipment is scarce and expensive, it favors Radiologists
There will be a growing Schism between Diagnostic and Interventional Radiology

- Different training requirements
- Different concepts of practice building
- Different measures of productivity
- Different personality types

Organ System specialization is an obstacle to the growth of interventional procedures!

"O douleur, l’avenir nous separe" from the opera Manon by Jules Massenet
And finally......

There will be other lectures !!

Thank you !!

“Try not to have a good time. This is supposed to be educational. “

---Charles Schultz