The Exeter Diamond
beyond the Stanmore Triangle

Tim Bunker MD MCh FRCS
Exeter
Mark Anthony..”I come to bury Bankart
Not to praise him….BUT”
Shoulder arthroscopy

- 1982 first shoulder scope in UK / Europe?
Shoulder arthroscopy

- 1983: cadaver studies
- 1984: n=50
- 1985: presented BOA Plymouth
- 1986: publication Annals
- 1986: start textbook
- 1987: Porritt Fellowship
Lanny Johnson, Lansing

- Dr Lanny Johnson (1982-6)
- Dr Paisch
- Staple repair
- 20% recurrence rate
Craig Morgan, Baltimore

- **Sutures** more tolerant
- **Caspari technique (1988)**
- But knot at back
- **Tenodesis effect**
- (Poor results)
- **50% failure (Walch)**
Shoulder arthroscopy

- 1989 first @Bankart UK (Clive W-Smith)
- 1990-1 first series @Bankart, n=12
- 1991 English edition
- 1992 French edition
- 1993 German edition
@ Bankart

- 4/12 @ Bankart redislocated
- For in a little town like Exeter failure is not acceptable
A peculiar practice

- Many difficult cases
- Loosey goosey shoulders
- Posterior positional
- Few TUBS
Open Bankart Repair
1990-2009

• Approach
Open Bankart Repair
1990-2009

- Weapons
- cephalic
Open Bankart Repair
1990-2009

- vessels

Diagram showing anatomical structures around the shoulder with labels acr, D, P, Thoraco Acromial trunk.
Open Bankart Repair
1990-2009

- vessels
Open Bankart Repair
1990-2009

• vessels

vri

Anastomosing branch PHCA

profunda
Open Bankart Repair
1990-2009

- capsulotomy

Dyslexic seven

N to S & E to W shift
Open Bankart Repair
1990-2009

- capsulotony

Effing capsulotomy

N to S
&
E to W shift
& double breast
Open Bankart Repair
1990-2009

- pathology
Open Bankart Repair
1990-2009

• pathology
Open Bankart Repair
1990-2009

• pathology
@Bankart 1999-2010

- Third hand
- Portal placement
- Preparation
- Anchors
- Suture management
- Suture placement
- Knots
- Shift
- Rotator interval closure
- Problems specific to arthroscopy
- Recurrence rate
• 2 year period n=233
  • >2 year follow up
  • Anchors and pinch tuck
  • 62 completed Fup
  • Half @, half open
  • 9 recurrences/62
  • Recurrence associated with bone loss & epilepsy
Definitions

• Instability =

• Excessive translation that causes symptoms in the conscious patient

  – Boileau 2009
Definitions

• Laxity does not equal instability
• CORRECT
• Some lax patients do not dislocate
• Therefore laxity is nothing to do with instability
• THIS IS SLOPPY THINKING
• FOR
• Some people who smoke do not get cancer
• Therefore smoking does not cause cancer
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  - In order to dislocate must be lax
  - Laxity is mandatory in dislocation
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• **Excessive translation** that causes symptoms in the conscious patient
  
  – Boileau 2009
TUBS and AMBRI

- Matsen
- Traumatic Unilateral Bankart Surgery
- Atraumatic MDI Bilateral Rehab
- Inferior capsular shift
- Service but disservice
There is a spectrum of dislocation.

Most patients will have elements of laxity and avulsion.
Open Bankart Repair
1990-2009

- pathology

Repair = B + C + RI
Polar I
structural

Non structural
Polar II

Polar III

STANMORE TRIANGLE
Stanmore triangle

- No mention of
- Anterior or posterior or inferior
- No place for posterior positional
- Overemphasis of muscle induced
Exeter diamond
Exeter diamond

structural

ANTERIOR

POSTERIOR

INFERIOR

Non-structural

Non-structural
Exeter diamond Pathology

- structural
- POSTERIOR
- atraumatic
- ANTERIOR
- inferior
- Posterior positional

BONE
Jo DeBeer
Antwerp 2004

- Bankart tear is rare
- Most dislocations take sliver of bone
- Some take a lot of bone
- "inverted pear glenoid"
Hill Sachs lesions
Bankart variations Habermeyer

Stage 1
- Normal Labrum
- ISOLATED LESION
  - Bankart Lesion
  - Labral Attachment Rupture
  - Isolated labral detachment with a present periostal hinge

Stage 2
- DOUBLE LESION
  - Perthes
  - IGHL Attachment Rupture

Stage 3
- TRIPLE LESION
  - ALPSA
  - Double Lesion with a labral remnant
  - Subglenoid Rupture
  - Fibrous adhesion below the level of glenoid

Stage 4
- QUADRUPLE LESION
  - Superglenoid Degeneration
  - Triple lesion and labral degeneration
  - fibrous scarring
  - distention
  - HAGL
  - hypoplasia
  - labral absence
243 shoulder videos analysed
8% complete circle avulsed
SLAP tears

- 1 fibrillation
- 2 avulsion of anchor
- 3 bucket handle
- 4 complex into LHB
SLAP tears

- 5  Type 2 SLAP extending into Bankart tear
- 6  Type 2 + unstable flap tear
- 7  Type 2 SLAP extending between MGHL & IGHL
- 8  Type 2 SLAP extending to posterior labrum
Hertel radial tear

- Detachment 94%
- Medialisation 76%
- Radial tear 34%
- Segmental gap 42%
Exeter diamond Pathology

POSTERIOR

structural

BONE

LABRUM

CAPSULE

Posterior positional

inferior

atraumatic
Capsular lesions

- Wide rotator interval
- Dysplastic MGHL
- Capsular tears
- Radial lesions
Loosey Goosey shoulders

- Congenital laxity
- Capsular stretch
- Capsular tears
- +ve drive thru sign
Exeter diamond Pathology

structural

BONE

LABRUM

CAPSULE

VOLUME

HAGL

POSTERIOR

Posterior positional

inferior

atraumatic
Exeter diamond Pathology

structural

BONE

LABRUM

CAPSULE

VOLUME

atraumatic

Posterior positional

MUSCLE INDUCED

RHAGL

in inferior

HAGL
Muscle patterning

- Stanmore
- N=1096 over 20 years
- Patterning in 45%
- And 100% of inferior dislocation
- (excessive ? Peculiar practice)
Muscle patterning Polar III

- Ordinary physio success 24%
- Specialist physio success 61%
  - Takes 2 years of physio
  - 25% of successes relapse within 2 years
  - Success = notes review
Muscle patterning Polar III

- Results of physio
- 10 X worse if have had surgery
  - Do not operate on them
  - Maybe got surgery because 10X as bad
Muscle patterning Polar III

- Jaggi; 3 subgroups
- Central E6
- Positional not MP
- Protective not MP
Exeter diamond Pathology

- structural
- BONE
- LABRUM
- CAPSULE
- VOLUME
- atraumatic
- HAGL
- Posterior positional
- MUSCLE INDUCED
- RHAGL
- inferior
Primary glenoid dysplasia
Bunker et al JSES 2001

- 12 cases
- Bilateral retroverted flat glenoid
- Clavicular bossing
- Bimodal presentation
- 12-24 clicking, instability, pain
- 48-69 secondary OA
Primary glenoid dysplasia

Bunker et al SAE 2009

- Father and son
- Gene disorder
- Autosomal dominant inheritance
Secondary glenoid dysplasia

- OBPP  25 children
- 7 normal glenoids
- 18 abnormal
  - 5 flattened
  - 7 biconcave
  - 6 dislocated with psuedoglenoid
  - Changes reversible with QUAD procedure
Exeter diamond Pathology

structural

BONE

LABRUM

Posterior positional

MUSCLE INDUCED

RHAGL

inferior

BONE

LABRUM

CAPSULE

VOLUME

atraumatic

HAGL
Postero-inferior dysplasia

- Edelson Clin Orthop 1995
- N=1150 dried scapulae
- Postero-inferior hypoplasia
- 19% Negev desert Bedouin
- 21% USA Caucasians
- 35% Mexican Indians
Postero-inferior dysplasia

- Edelson
- 300 CT and MRI
- Convex post-inf glenoid 18%
- Lazy J shaped
Postero-inferior dysplasia

- Edelson
- 12 scans of post dislocators
- 9/12 had Lazy J appearance
Postero-inferior dysplasia

- Innui et al Clin Orthop 2002
- MRI 20 patients, 45 normals
  - Dislocators 60% convex at lowest plane
  - Normals 78% concave
Postero-inferior dysplasia

- Kim et al. Arthroscopy 2004
- Kim et al. JBJS 2003
- 1 recurrence in 15 cases
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4 levels of evidence

- 1 relocation
- 2 provocation
- 3 translation
- 4 excess ROM
Exeter diamond exam

structural

POSTERIOR

1 = relocation (Jobe)
2 = apprehension

Posterior positional

inferior

Non-structural
Reproduction

- (Apprehension)
- Crank
- Relocation
Exeter diamond exam

structural

1 = posterior jerk
2 = Kim test

1 = relocation (Jobe)
2 = apprehension

Posterior positional

Non-structural

inferior
Reproduction

- Posterior jerk
KIM TEST
Posterior positional
Exeter diamond exam
level 3; translation

Anterior drawer

Pjerk Kim

Jobe Appre
Level 3; translation

- Often done incorrectly!!!
- Depends on unpacking capsule
- As with Leadbetter or Flynn in hip
Drawer tests

- Rockwood & Matsen
Drawer tests

- Ganz & Gerber
Unpacked drawer test

• unpacked drawer test
Grade

- Normal  G0
- Hmmmm   G1
- Wow      G2
- Oops     G3
Exeter diamond exam

Anterior drawer
UADT

PjerK Kim
JoBe Appre

EEEEEEEperlaxity
Definition of laxity must first define normality and the verb “to be normal”
I am normal
you are strange
they are peculiar
Normality  Laxity

- Elevation  170°  >180°
- Ext Rotation  70°  >85°
- Int rotation  T7  T3-4
Eeeeeeeeprlaxity

- French
- “Zis patient iz eeeeeeeprlax”
- 90° plus external rotation
Exeter diamond exam

- Anterior drawer
- UADT
- EEEEEperlaxity

Diagram:
- Pjer Kim
- Jobe Appre
- sulcus
Sulcus sign
Exeter diamond exam

Anterior drawer

UADT

EEEEEperlaxity

Pjerk Kim

Jobe Appre

sulcus

Gagey

Hyperabduction sign
Gagey Sign

- Inferior capsule lax
- >110° abduction
Hyperabduction sign

• Symptomatic side Gagey
• 20° more than
• Asymptomatic side Gagey
Exeter diamond exam

- Anterior drawer
- UADT
- EEEEEExperlaxity

Pjerk Kim

Jobe Appre

sulcus

Gagey

Hyperabduction sign

Orang-Utan sign
Orang Utan Sign

- (Bunker & Schranz, The Shoulder 1998; Isis)
Exeter diamond exam

- Anterior drawer
- UADT
- EEEEEperlaxity
- Pjerk Kim
- Jobe Appre
- sulcus
- Polar III
- Gagey
- Hyperabduction sign
- Orang-Utan sign
Exeter diamond exam

- Anterior drawer
- UADT
- EEEEEperlaxity
- Posterior drawer
- UPDT
- PjerK Kim
- Jobe Appre
- sulcus
- Polar III
- Hyperabduction sign
- Orang-Utan sign
Unlocked Posterior drawer
Exeter diamond exam

- Posterior drawer
- Anterior drawer
- UPDT
- UADT
- Dimple
- Pjerk Kim
- Jobe Appre
- EEEEEperlaxity
- Sulcus
- Polar III
- Hyperabduction sign
- Orang-Utan sign
- Gagey
Look, Posterior Dimple
Bunker, Campbell, Ramesh, Van Raebrook

• Dimples
• Posterior jerk
Beighton Score

- Wrist flexion 2
- Little finger extension 2
- Elbow recurvatum 2
- Knee recurvatum 2
- Palms on floor 1
- Total 9
Understanding

- Understanding
- Pathology is variable (bone/labrum/capsule/volume)
- Assessment (relocation/provocation/laxity/range)
- Allows us to consider treatment

**ONE SIZE DOES NOT FIT ALL**
Exeter diamond treatment

structural

Posterior positional

inferior

B

K

L

B

Latarjet
Exeter diamond treatment

structural

Latarjet

@Bankart

Posterior positional

inferior
@ Bankart

- Not without problems
- Technical problems
- Recurrence rate
- Pain
- Stiffness
- Squeaking
Problems

- Third hand
- Portal placement
- Preparation
- Anchors
- Suture management
- Suture placement
- Knots
- Shift
- Rotator interval closure
- Problems specific to arthroscopy
- Recurrence rate
Recurrence Metanalysis
Tingart, Bathis, Bouillon, Tiling Unfallchirurg 2001; 104: 894-901

- Arthroscopic vs open Bankart
- Metanalysis of 172 publications
- 12 prospective studies
- Open 0-8%
- Arthroscopic 8/12 studies <10%
- “Arthroscopic repair has not been shown to be equal or superior to the open technique”
Recurrence Metanalysis
Mahtadi, Hollinshead, Harper et al. Arthroscopy 2005

- Reviewed 979 articles
- 18 worthy of analysis
- Open vs closed
- Open repair has more favourable outcome
Recurrence Metanalysis

• 18 articles
• @ not as effective as open Bankart
• In preventing instability
• Or in return to work
Recurrence Metanalysis
Hobby, Boileau et al

- Metanlysis of 62 studies
- 3044 dislocation repairs
- Failure of @Bankart higher than open
- But if you look at modern papers
- They are more equal
@Bankart recurrence

• JP Warner 2008 5-19%
• Resch 2008 38% ten years
• Elmlund 2008 18%
• Boileau 2007 15%
• Provencher 2007 15%
• Rhee 2007 17%
• Cho 2006 17% collision
• Brownson 2006 10%
Boileau ISIS score

- Age: under 20, 2
- Sport level: competition, 2
- Type sport: collision, 1
- Hyperlaxity: exam, 1
- Hill Sachs: AP film, 2
- Glenoid loss: Bernageau view, 2
ISIS score break points

<table>
<thead>
<tr>
<th>ISIS</th>
<th>recurrence rate</th>
<th>p value</th>
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<tbody>
<tr>
<td>&lt;=3</td>
<td>4.8%</td>
<td>&lt;0.001</td>
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<tr>
<td>&lt;=6</td>
<td>9.9%</td>
<td>&lt;0.001</td>
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<tr>
<td>&gt;6</td>
<td>70%</td>
<td>&lt;0.001</td>
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</tbody>
</table>
Val d’Isere 2009

- **Surgeon**  @Bankart  Latarjet
- **Boileau**  45%  55%
- **Lafosse**  35%  65%

**WHY?**
Exeter diamond treatment

structural

B
K
L
C
V

Posterior positional

inferior

Latarjet
@Bankart
ISIS

HAGL
Treatment

• Capsular laxity
  – Double breast
  – NS shift
  – EW shift
  – RI closure
Exeter diamond treatment

structural

Posterior bone block

Posterior positional

B
L
V
HAGL

K

B
L
C

@Bankart

ISIS

inferior
Exeter diamond treatment

- Posterior bone block (B)
- Pinch tuck plication
- Kim procedure
- Posterior positional

Structural:
- Latarjet
- @Bankart
- ISIS

Inferior:
- HAGL
Exeter diamond treatment

- Posterior bone block
- Pinch tuck plication
- Kim procedure
- Posterior positional

structural
remplissage

B

Latarjet

B @Bankart

K

ISIS

C

V

HAGL

inferior

?
Polar III
Polar III
E6

Shorthand for
“don’t touch with a broom handle”
Barking
Polar III

Patient demonstrates translation with arm at side
Induced by muscle pull
Muscle patterning

• Codman
  
  “I am not in sympathy with the view of those authors who hold that the contracted pectoralis and latissimus act as a fulcrum to promote dislocation of the head of the humerus. I think the reverse is true, this action merely acts to prevent dislocation”

p269
Exeter diamond exam

- Posterior drawer
- Anterior drawer
- UPDT
- UADT
- Dimple
- Gerber IR Test
- Polar III

sulcus

- Pjerk Kim
- Jobe Appre
- EEEEEEperlaxity
- Gagey
- Hyperabduction sign
- Orang-Utan sign
Exeter diamond treatment

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- Posterior positional

Structural remplissage

Latarjet

@Bankart

ISIS

HAGL

Inferior
Thank you