

Practical Arthroscopy Newsletter Vol 10 No 5 2006

Editorial



This years meeting was held on the Kailua coast in Kona, Hawaii. This is normally a dry desert climate, with only a few inches of rain a year. This year there had been 6 weeks of continuous rain over all the islands, and people were not allowed in the surf at Waikiki beach, due to pollution from runoff. We had some rain locally, but did manage a few games of golf. On one bad day of pouring rain, we were inundated with 14 papers on the double bundle, and a 10 hour day! That is just as bad as the pouring rain.

We did manage a little social time, and the award to the best hula dancer goes to Roger Larson!



Roger Larson demonstrating his hula dancing skills.



Hapuna Beach Resort on the Big Island of Hawaii.

DJ' summary of some of the papers at the ACL Study Group 2006.

Review of Treatment Trends of ACL, PCL, MCL, and Cartilage problems – John Campbell

It still is interesting to me that this group of serious ACL surgeons, 66% still does not use the validated IKDC outcome measure. Half of the group does not use the KT-1000 arthrometer to document the a-p translation. This group would not routinely repair/reconstruct isolated MCL or PCL tears. Most of the group has no age limit for ACL reconstruction and 60% still use the BTB graft. This correlated

with the 60% who felt that the use of the hamstring graft weakens flexion of the knee. There are 20% that use the 2 incision technique, and probably have no trouble putting the graft at the 10 and 2 o'clock position on the femur. The rehab protocols are still widely divergent, but most allow full extension immediately, closed kinetic chain exercises and biking by 3 weeks post-op. Jogging was allowed at 12 weeks and return to sports by 6-9 months. There was a trend for most surgeons to do an ACL reconstruction with hamstrings on a 12 year old with open epiphysis.

Native ACL Biomechanics – Bob Arciero

This was a basic science lab cadaver study using a strain gauge for a kinematic study. He confirmed that the AM bundle is tight in flexion and the PL bundle is tight in extension. He then studied the single socket double bundle technique of Caborn and Morgan which they wrote up in Arthroscopy in 2005.

In this study, by measuring the strain, the single socket double bundle works as native tissue. The single bundle does not separate, and works only as an AM bundle.

Injury Trends in DH Skiing – Bob Johnson

This was the culmination of 20 years of data collection from a Vermont ski hill. Johnson noted that there is a 20% decrease in ACL injuries since 1990. Females have 2.4 X the injury rate of overall knee injuries. Much to the surprise of many there was no reduction in injury risk with taking lessons. There were more left sided ACL injuries. He was at a loss to explain this. Similarly he was unable to understand why the use of a helmet is protective for all injuries, including ACL injuries ??? Johnson has published the mechanism of the phantom foot, and this is associated with ACL injuries, and is specific for ACL injury.

Ski boards were a bad idea as they increased the injury rate.

If the ski length is 75% of the height of the person, then there are fewer injuries.

The binding reduces fractures, but not ACL injuries.

ACL injury is 15% of all injuries – and is the MOST COMMON ski injury.

Active or Passive Mechanisms of ACL Rupture.- Parker

The active mechanism is caused by quads contraction and is non-contact. The passive mechanism is contact caused by a direct blow.. The purpose of the study was to study the bone bruises on the MRI that were associated with ACL injury. In previous studies bone bruises were more common laterally on the tibia. They were deeper, and more intense in the active group on the lateral side.

In this study, bone bruises occurred on the medial side, and more often than reported in previous studies.

What are the long-term implications of bone bruises? This is still unknown.

What is the late sequelae of the bone bruise? Can any late degenerative problem be prevented by a prolonged period on crutches? We need to image cartilage better to be able to follow this with a non-invasive test.

Restoration of Normal Joint Play. Tom Branch.

The question is: what is the main function of the ACL -control of anterior translation or axial rotation?

Kocher found that the pivot shift correlated more accurately with the patients' symptoms compared to the anterior rotation measured by the KT-1000.

Branch has a novel method of measuring the pivot shift with a computer and a gig that measures the a-p translation and the rotation of the tibia.



Fig Tom Branch demonstrating his device to measure the envelope of motion in the a-p and rotational planes.

The patient with a normal loose knee on the uninjured side is going to be less happy with surgery. This is opposite from what we thought. We felt that the tight knee tolerates laxity less well, and have some data to show this.

He also feels that the VAS scale from 1-100 is the best method to measure patient satisfaction; this is similar to the SANE scale (single numerical evaluation).

The Osteoarthritic Matrix – Scott Dye

We are seeing more late osteoarthritis is developing after ACL injury. Dye theorizes that this is due to the loss of osseous homeostasis of the joint. The bone scan will demonstrate the loss of osseous homeostasis, even before structural changes will be seen on the MRI or plain x-ray.

He again expanded on his “Concept of Envelope of Physiological load Acceptance of the knee joint”. I think that this is an excellent way to think of the function of the knee and how to explain to patients that perhaps they should reduce the stress that they apply to the joint after injury or surgery. The one downside of this is the amount of radiation required for multiple serial bone scans.

Osteoarthritis and Function after ACL Rupture after ACL recon and non-operative treatment: after twelve years of follow-up – Kessler

This study group of 94 patients consisted of 47 non-op, and 47 recon patients.

The outcome measures were the Tegner scale, BMI, and IKDC score

There was better correlation of function on IKDC score.

In the ACL recon group 53% had signs of osteoarthritis by the Kellegran scale, compared to 43% of non-operative group.

The conclusion was that the conservative group had less overall osteoarthritis.

It was surprising that the operative treatment group had no improvement in the Tegner activity score. Even in high level sports there is no reduction of

osteoarthritis by ACL reconstruction. The continued involvement in high level impact sports in itself probably leads to some of the degenerative changes. To no great surprise there was more osteoarthritis with high BMI, and this had no effect with therapy.

Incidence of OA and ACL Deficiency – Jon Browne

Total knees were examined for ACL deficiency, meniscal status, chondral status.

Browne found that 43% of total knee patients had a normal ACL

- 21% had an abnormal med meniscus
- medial compartment osteoarthritis was more common
- 13% severe medial osteophytes

19% of the total knee patients had ACL deficiency

- 50% medial meniscus was gone
- all three compartments were involved with more severe OA
- 8x more likely to have severe lateral compartment osteoarthritis with more severe lateral osteophytes

Summary: The incidence of previous ACL tears was uncommon with total knee patients, and those that had ACL deficiency had more lateral compartment osteoarthritis, but the clinical outcome of the TKA of both groups was the same.

Incidence of Extension Loss after ACL Reconstruction – Jim Lubowitz

The hypothesis was that the extension loss with current indications, operative procedure, and rehab, is less than reported in the literature.

On retrospective review of his patients, the extension loss is minimal, 0.75% incidence. He did not use the heel height difference to measure the true loss of hyperextension. This study was level IV of evidence.

How well do Posterolateral Reconstructive Procedures Restore Varus Laxity? – David McAllister

He used the inlay PCL technique with the Mueller by-pass procedure, lateral

ligament reconstruction, and popliteal-fibular ligament reconstruction.

All the grafts restored the external rotation, and varus moment, and they reduced the forces in the PCL inlay graft. He found that over constraint was possible.

Prospective randomized clinical trial of double, AM, and PL bundle reconstruction. – Kurosaka

This study was reported at this year's Academy and was reviewed in the previous issue of Practical Arthroscopy. The authors compare the dynamic rotational instability of double bundle , single AM, and single PL bundle reconstructions. The follow up was short at 1 year, but they had 100% follow up. They removed the screw from the tibia, and had the opportunity to perform the pivot shift under anesthesia. At the same time the 3D knee kinematics was measured with external sensors. KT-1000 was the same in all groups; the .6 mm reduction in the anatomic group was not clinically significant. The pivot shift test was negative in the anatomic double bundle group in 85%, negative in the single AM bundle group in 75%, and negative in the single PL bundle group in 80% Is it really worth the effort to reduce the mean of the KT values .6mm???

Double bundle ACL single versus double incision. Aglietti

The controversy is to drill the femoral tunnel transtibially versus outside in. Aglietti uses the Howell tibial guide with an outrigger to drill the second tunnel for the posterolateral bundle.

He drills the femoral tunnel with the transtibial offset aimer. The posterolateral femoral tunnel was also drilled through the transtibial tunnel. (it appeared as the PL was too shallow and superior)

This technique was compared with the rear entry guide, and an outrigger for the femoral tunnel to drill from outside in. He used the Amis circle method on MRI evaluation. He found that the PL tunnel was in better position with the rear entry technique.

He tensions the PL bundle at 10*, and the AM bundle at 40*, each with 20N of

tension. That is less than the 40N used by Kurosaka.

The 3 groups were:

- A Single bundle
- B double trans-tibial
- C double rear entry.

The results were:

- IKDC subjective better with C
- IKDC final were the same
- Pivot shift negative better in the C
- KT-1000 values were also better with C

The conclusion of his study was that the femoral tunnels should be drilled from outside in. This is the same opinion that Shino holds.

Assessment of fracture risk with single and double bundle ACL reconstruction – Kevin Bell Pittsburg

A fracture of the distal femur can happen with single femoral tunnels, and maybe there is an increased risk with 2 tunnels. Freddie has said that in the 250 double femoral tunnels that he has done there has not been a fracture.

The size of the tunnels were AM - 7 mm, and PL - 6 mm. They loaded the femur at 0, 30, 60, 90, 120 angle of knee flexion with 1000N on each condyle.

There was no increase in stress with drilling the second tunnel.

The Influence of Tunnel-Graft Length – Zantop Pittsburg

This study was designed to compare having 15mm versus 25 mm of graft length in the femoral tunnel of a goat. The grafts were secured with Endobutton on the femur, and a suture post on the tibia. The goats were harvested after 6 and 12 weeks, and loaded to failure. There was no difference in load to failure between the 15 and 25 mm graft lengths at 6 and 12 weeks. The tunnels heal from outside in at the tunnel entrance over 6 mm at the aperture. The implication is that autograft hamstring may be used for the double bundle reconstruction.

Knee Dislocation with Lateral Side Injury: Results of Surgical Treatment Don Shelbourne.

The multi-ligament injured knee with a posterolateral corner injury is not a common injury; it is less than 1% in Don Shelbourne's database. He has only seen 67.

There are many structures that are involved. It is common for the capsule, biceps, and lateral collateral ligament to tear distally and retract. In 30% of the cases this was associated with a peroneal nerve injury. An MRI scan helps with diagnosis. The PCL can heal, but not the lateral side injury. This is due to retraction of the distally torn structures. You must do en masse repair early, within 2 weeks, with a simple staple and suture reattachment. You can treat the PCL injury conservatively, but you must keep the tibia forward, to heal in a shortened state.

The results: 17 patients available for evaluation 4.6 years post surgery. IKDC 94. 17 were normal or nearly normal. The stress x-rays showed only 1 mm SSD. The early surgery had a better score, and the late repairs did not do as well.

ACL augmentation with one incision technique: AM or PL recon – Ochi

Ochi's message was to try and preserve the remnant of the ACL for strength, and proprioception. He found that at the time of arthroscopy in chronic cases 42% of the ligaments show complete resorption. 59 patients had single bundle reconstruction, and most were AM bundle reconstruction.

The authors stated that the single AM bundle reconstruction was more common, and easier to perform. A single double looped hamstring graft could be placed in a tibial tunnel drilled just in front of the existing PL bundle, and into a femoral tunnel that was drilled through the tibial tunnel, at the 10:30 position on the femur.

Double bundle Symposium

Freddie Fu gave his double bundle concept talk. This is the same talk that I have heard over the past year, but I still learn something from this each time. It has

got us thinking about the injury pattern, and where we should drill the tunnels. It has made the single bundle advocates make the tunnel lower on the wall. It also made us think we should make the anteromedial bundle tibial tunnel more shallow to make an oval tibial entrance tunnel. This may spread out the tibial attachment a little better. He drills his femoral tunnel from inside out. He views the femoral notch from the AM portal, at 90° to get a better view, and appreciation of the anatomic sites.

Yasuda gave his clinical results on single, and double bundle reconstructions. The PL can be created 5 mm above the articular edge. He uses the tibial tunnel to drill the femoral tunnel. The AM tunnel is 6-7 mm in size, and the PL tunnel is 5-6 mm. He tensions and fixes both grafts close to extension.

Results:

He compared 3 groups; single tunnels, Rosenberg double femur and single tibial tunnels, and the anatomic double femur and double tibial tunnels reconstruction. He found that the SSD KT-1000 difference, and pivot shift, were better with anatomic double bundle group. There was no difference in ROM, muscle strength, and IKDC scores.

2 bundle – 97 Lysholm with 1.2mm SSD

70% underwent second look arthroscopy, and the ACL appeared normal.

Only 1% of the grafts were stretched and abnormal.

Only 4% of the PL bundles were abnormal.

Does the anatomic double bundle provide a benefit to ACL deficient knee?

No difference in complications, Lysholm score, ROM, or muscle strength.

The a-p stability was better (only 1 mm), and the pivot shift was improved.

The operative time was not much longer, only 50 minutes for the double bundle versus 40 minutes for the single tunnel reconstruction.

Jurgen Eichhorn gave his impressions of 10 years experience with the double bundle ACL reconstruction. He uses only the semitendinosus, and he feels that you don't need more than 15 mm of graft in the tunnel. He uses a double guide

wire tibial guide. He drills most of the femurs through the tibia, but if he can't get there, he uses the AM portal. He uses an endobutton on the femur, and he uses a suture disc to tie the tibial sutures over and tighten. He tensions, and fixes the AM bundle at 50° of knee flexion, and the PL bundle at 10° of knee flexion. He has no value for the correct amount of tension, just tight!

In his practice most patients get a double bundle reconstruction, except for young patients or old patients. He uses double femoral tunnels, and double tibial tunnels. He uses no screws in tunnels. He feels that this gives better tensioning, and there is more bone to tendon contact to improve healing, and reduce the bungee and windshield wiper effect that produces tunnel enlargement.

He finds 2 common clinical situations of the AM bundle intact, with a Kt value of <3 mm, with a positive pivot shift due to the torn PL bundle. In the other situation, the PL bundle is intact, with a Kt > 5, and pivot glide.

He advocates the use of navigation (Orthopilot) for the AM bundle; this gives him impingement information, and allows drilling without visualization. With navigation, the internal rotation is reduced by 70% with the double bundle procedure. The DB stays stable over time, even with associated lesions.

Steve Howell made some observations about the single bundle reconstruction. Make sure there is no PCL impingement, by putting the tibial tunnel slightly more lateral. One tunnel can be better with lower femoral tunnels. There are no clinical studies to show DB is much better than single bundle reconstruction. He gave his philosophy of the PCL impingement. You should avoid the graft wrapping around the PCL, as the graft eventually stretches out in flexion. He uses some lateral wall notchplasty to make room for the graft. If you have a 9 or 10 size grafts, you need a wall plasty at the top corner. You should move the tibial tunnel to 60° in the coronal plane to give a triangle of separation between the PCL and ACL. He makes a point that the double bundle surgeons may place the AM bundle too high or vertical. He showed that the double bundle surgeons don't all place the AM tunnels in the same place. Once again he emphasized that there is no significant difference in double bundle and single bundle in clinical studies.

One of his take home thoughts was that maybe one bundle between the AM and PL bundles would work fine.

Don Shelbourne summed up the double bundle symposium.

Where can we improve the technique? Where did we find the problems with the single tunnel technique? Don't forget that to improve outcomes, the knee should have full ROM, equal strength, and no laxity. A stiff stable knee is worse than persistent laxity. You should measure the hyperextension with heel height difference in the prone position. The patient should sit on the heels to measure the full flexion.

What factors affected the long-term results?

- Lack of normal knee motion
- Time from injury to surgery
- Partial menisectomy

In his follow up there was no significance of age, sex, or KT values.

The subjective IKDC scores are lower with loss of flexion, and extension.

If both menisci are removed, or there is damaged articular cartilage, the subjective scores are lower. Abnormal x-rays, and lack of motion are significant and give lower scores. The problem of lack of motion is going to be the same with the DB technique. In summary, be a knee doctor, and take responsibility for rehab, and ensure full ROM after any surgical procedure.

The Panel comments:

Yasuda uses hamstring grafts, and has no problem with ROM.

Freddie Fu finds better ROM with DB. Do we need the second PL bundle?

Steve Howell stated that the vertical single tunnel produced PCL impingement with flexion loss.

Eichhorn says don't be afraid of PCL impingement!

There was some discussion between Cristel and Howell about creating the femoral tunnel transtibially versus independent tunnels. Most use the femoral footprint to determine where to make the tunnel. Navigation may help.

Yasuda says you must know anatomy; look through the AM portal, use the knee at 90*, and create the PL tunnel 5 mm from the articular cartilage edge.

Fu uses anatomy to place his tunnels, and uses no guides.

Do we need 2 bundles? You have 2 bundles, so repair them!!

Yasuda does the double bundle on high level athletes.

A comparison of patellar tendon and hamstring grafts for ACL

Reconstruction – Dean Taylor

Taylor reported on an RCT of young active patients, and found that with the HS grafts he had 15% failure, and with the BTB he had 10% failure. The fixation was the same, Bioscews that were augmented on both sides. There was no difference in the other outcome measurements.

ACL graft selection: Patient Concerns and Priorities - Walter Lowe

In 63% of the time, the most important factor in the patients decision making is the recommendation by the physician. They decide on their own in 30% due to other priorities. The factors were different in the under 30, and over 30 years of age. Some of the factors were type of sports, type of work, such as kneeling, risk of disease transmission, and cosmesis. Some patients were contradictory, especially young female competitive athletes, and picked allografts.

The patients who picked BTB ranked sports level of participation as the main factor. In the HS graft choice the patients ranked disease transmission as important. The allograft patients ranked pain as a major factor in their choice of graft.

Choice of Grafts for ACL reconstruction – Economic issues – Forssblad

In a study from Stockholm the author found that the BTB graft fixed with metal screws was the cheapest graft to use.

The effect of donor age and irradiation on the tensile properties of soft tissue grafts. – tibialis grafts Charlie Brown

Studies in the past have shown old age of the allografts to be related to weak tendons. Low level of irradiation on soft tissue grafts has been reported to have no effect.

The hypothesis was that tissue up to 65 years, and low dose irradiation, would have no effect on the strength of the tendon.

The tibialis was tested as either double or single strand grafts.

There was no significant effect of age, or irradiation on the tensile strength.

The most important factor was how large was the cross sectional area; the larger grafts were stronger.

Anterior tibialis allograft ACL reconstruction – 2 year FU Dan Keefe.

The hypothesis in this clinical study was that the tibialis allograft was an acceptable graft, from a biomechanical anatomic point of view.

In this study, the construct was fixed on the femoral side by an interference screw, and on the tibial side with screw and post (learned from this study not to use the screw post)

The results showed that 96% were satisfactory, with a mean IKDC subjective score off 86. The Lachman was normal in 60%, and the pivot shift was positive in 12%. There were no infections. There were 7% failures, based on objective measurements.

Notch Measurements – Alan Anderson

In this cadaver study, x-ray measurements of the notch were done to validate the accuracy. Barium was then used to outline the notch, and the notch was again measured with a caliper. The authors noted that the size, and shape of the notch changes with knee flexion angle. They also saw that there was significant variability in the notch width measurements, due to rotation, and knee flexion angle.

The author's conclusion was that radiographic measurements of the notch size are inaccurate.

Radiofrequency Electrothermal Shrinkage of the ACL – Tom Carter

In a long term review of his thermal shrinkage patients, his failure rate in the acute scenario was >50%. Based on his review, he stated that the indication for thermal shrinkage is very uncommon.

We currently also have a 50% failure with native tissue. This high failure may be due to excessive shrinking, and shrinking isolated bundles.

Fluoroscopic navigation of bone tunnels in ACL reconstruction – Jurgen Hoher

The Brain lab system uses optoelectronic tracking device, same as Orthopilot.

There are 4 steps:

1. Attachment of the reference frames to tibia and femur
2. Fluoroscopic images
3. Planning phase
4. Navigation of drilling

The hamstring grafts were fixed with Bioscrews, and the AM portal was used to create the femoral tunnels. The added surgical time was 13 minutes and the x-ray time was 73 seconds.

This was a series of 22 patients, who were all stable in follow up, with only one complication. This technique may work as it is common to use fluoro in the OR and may be more accurate than orthopilot.

Does it help the patient? Probably not.

Does it help the surgeon? Yes

This may be useful for double bundle reconstruction.

The Waggle test was demonstrated by Feagin on Roger Larson. The patient lies face down, the knee is flexed to 30*, and then waggled into varus and valgus.

This tests the PL bundle of the ACL. The PL bundle is tight near extension, and resists both rotation and varus. This might be useful to assess the post-op reconstruction.

Anatomic Double Bundle ACL Reconstruction: 18 month FU Cristel

Cristel uses inside out drilling of the femoral tunnel through the AM portal at 120* knee flexion. The tibial tunnel is done with double tibial guide.

The AM is fixed at 30-45* of knee flexion, and the PL at 15* of knee flexion, and each bundle is tensioned at 50N. The rehab is the same as single bundle, with return to sports at 6 months.

Results:

148 patients with average 18 month FU

Outcome measurements: IKDC, KT, Tegner

95% were level 1 or 2 activity level.

ROM normal

92% had a negative pivot shift, and 7% had a pivot glide.

There were no major complications, and no graft rupture.

The pivot was evaluated by the senior surgeon. (good way to introduce bias)

The authors conclusion was that the operation was safe, and reliable, with a satisfactory outcome.

Landing Strategies After ACL Reconstruction – EMG analysis. Markus Arnold.

The EMG was used to measure the recruitment of all the muscles of the leg when jumping 6 months after ACL reconstruction. The patients landed with more erect posture in the operative leg. “stiff landing strategy”

The take away is that the neuromuscular control is not normal after ACL reconstruction, even though the knee is stable. This is just another example of the incomplete recovery, and potential for re-injury when returning too soon after ACL reconstruction.

ACL Injury Prevention Symposium

There are 6 studies that have protocols to reduce injury rate. Half of these reduced the ACL injury risk. Neuromuscular training can reduce the incidence of ACL injuries

See current concepts review by Hewitt in AJSM 2006.

Performance enhancement with plyometric training and balance training is the

best protocol. Balance training alone in females did not reduce the risk. Training interventions with plyometrics correct the imbalance. Hewitt used trainers to teach the athletes. One of the main exercises is single leg balance on unstable surfaces.

European perspective of training programs to reduce ACL injuries – Hans Pessler.

Engelbretsen reported in 2004, an injury rate of 88 per 100,000. There is a large increase in females in sports, especially soccer in north America. He advocates the use of the balance board to train proprioception, and jump training to improve strength in high level soccer players. This program showed a 70% reduction of ACL injuries. Werner did a study on balance training in females, and showed that there was no difference. Ekstrand did a prophylactic training program, and reduced the injuries in soccer. Engelbretsen's group was able to reduce the injuries in team handball. The training program has received a large grant to do the training program. The program was balance, strength training with jumping, and sports specific handball exercises. This produced a significant reduction in handball injuries.

Revision ACL reconstruction – McGuire

He presented his extra-articular procedure. Larson feels that you can control rotation better by an extra-articular repair.

Revision ACL reconstruction – Engstrom

In Sweden most revisions were done with BTB grafts. The reason for revision was trouble with ADL's. The reason for failure in 40% was surgical technique. He used the KOOS outcome scale.

Results:

IKDC – 65% normal or nearly normal

Tegner 5 Lysholm 74%

Can you do whatever you like? Yes 40%

A hint to help with the femoral tunnel placement is to make the mark at 10 or 2 with a microfracture awl, and view through the AM portal, and move the knee through full ROM. You should always be able to see the mark.

PCL Impingement in ACL reconstruction – Eriksson

This was a study to prove the existence of the so called PCL impingement of the ACL graft. It is recognized that the 10 and 2 o'clock position are the best positions. He placed a graft in a cadaver, and measured the graft length change in all flexion angles. The graft was placed at 10 and 2 o'clock positions. Up to 120 angles there are no changes. Above the 120* the graft is elongated around the PCL. If the PCL is cut, then there is no elongation of the graft.

The 10 clock position can be seen throughout the range of motion in the clinical arthroscopic view from the anteromedial portal. The wider notch was not more forgiving.

Arthroscopic ACL reconstruction with and without extra-articular tenodesis. Phillipe Neyret

This was a long term review of the addition of the extra-articular reconstruction to the normal endoscopic ACL reconstruction. The extra-articular improves the subjective results, but not the objective results over the long term.

In the short term it improves the pivot shift, with less tibial translation in the lateral compartment

2-16 year radiological evaluation of the bone bruise. Klootwyk

This retrospective clinical study evaluated ¼ of patients, with IKDC, strength and ROM. The study showed considerable x-ray change after a bone bruise in the long term follow-up. In Spindler's study, he did not show any significant change in long term follow-up. Fowler compared the group with no impact for 6 months versus normal rehab. The bone scans at 1year showed residual changes in the normal rehab group. Conclusion from this study was to protect the bone bruises

from impact loading during the rehab. The unanswered question is does bone bruise lead to DJD? What is the radiation of a bone scan? Considerable
Chest x-ray 4 millirems
Bone scan 440 millirems

Tibial Fixation of ACL Grafts with Retrograde Interference Screw Techniques – Dressler

In this clinical study hamstring grafts were fixed with bioabsorbable interference screws in a retrograde fashion in the tibia. Morgans technique.

Results:

39 patients followed for 39 months

IKDC A+B 92%

The results were slightly better with the retroscrew technique. (any bias here)

Does 1 o'clock versus 2 o'clock influence the clinical outcome – Peter Fauna

This was a RCT with a power study!

Results:

The pivot shift was not significantly different

The objective IKDC was the same, but the subjective was better with the 2 o'clock. The patient felt better with squatting and jumping, and had better athletic performance.

The weakness of this study was that they used the transtibial approach to the femur.

The conclusion was to make the tunnel as oblique as possible.

Impact of Measurement Error in Analysis of Bone Tunnel Enlargement After ACL Reconstruction Julian Feller.

The author used 2 raters to measure the tunnel enlargement after ACL reconstruction with hamstrings. He calculated the increase at 1 year over the size of the drill bit used at the time of reconstruction. He found random error was

10%. He felt that this was more reliable in determining large changes. No enlargement had 0.8 mm change, and the enlarged group had 1.8 mm of SSD. He is one of the first to note that the patients who had enlargement also had more laxity. The lateral tibial x-ray was more reliable to determine tunnel enlargement.

ACL Reconstruction with Hamstrings: The Influence of Compaction Drilling on Tunnel Widening. Reiner Siebold

This was a RCT to compare extraction versus compaction drilling. The hamstring grafts were fixed with endobutton on femur, and Intrafix on the tibial side. They did CT scans at 2nd post-operative day, and 4 months post operatively. At 4 months the extraction drilling always showed tunnel widening. The compaction drilling group was the unchanged. The amount of tunnel enlargement was the same on the tibia with bioscrew and the Intrafix. There was always more CL Endobutton widening. No difference with the amount of compaction. The authors concluded that compaction drilling produced less tunnel enlargement.

Prospective Incidence of Contralateral normal ACL tear after ACL reconstruction. Kurt Spindler

This was a multi-center clinical trial to determine the incidence of opposite knee ACL tear after ACL reconstruction. Why? To counsel the patient to avoid injury to his normal knee.

408 patients were reviewed, with a 2.5% failure of reconstruction, and a 5% risk of opposite knee ACL tear. This is a lower incidence in the 8% quoted by Shelbourne.

ACL reconstruction in young soccer player. Jose Huylebrook

Micheli and Fowler's study quoted. Kocker's study published in the J Pediatric Orthop on the complications of ACL reconstruction in young patients.

In this study of 35 patients, 27 of 35 had associated lesions. The Lysholm score

was 88. There were no growth deformities or shortening. There were 4/35 failures.

Conclusion: early surgical stabilization should be carried out before associated injuries occur.

Triple bundle ACL Reconstruction – Shino

Shino's premise is that a thick graft in a single femoral tunnel is not strong. In his repeat arthroscopy of ACL reconstructions many showed partial tears of the bundles. The normal ACL has PL, AM, and an intermediate bundle on the tibia. He theorizes that you need 2 bundles for the AM, and single bundle for the PL. He drills the femoral tunnels from outside in. He uses the medial portal to visualize the points on the femur. He uses 5 or 6 mm drill bits. On the tibial side he uses a triple tunnel using a gatling gun guide. These are small tunnels. He pulls the PL through first, and fixes it with an endobutton. He pulls the AM into the joint through the AM portal, and then retrogrades the end of the tendon down into the 2 tibial tunnels. He uses a screw post on the tibial side with 60N of tension, depending on the diameter of the graft.

He presented some early results. He would still do a BTB graft in young soccer player due to some HS graft failures, and incomplete incorporation of the hamstring graft in the femur.

Medial Opening Wedge and the Sagittal Plane – Bob Arciero

Arciero emphasized not to increase the tibial slope in ACL deficient knees. The current plate that is placed anteromedial position will increase the tibial slope. They compared placing the plate anteromedial versus a posterior placement. They placed transducers in the joint to measure the changes in medial joint pressure. The anterior and posterior plate increases the valgus by 10*. The anterior plate increased the slope, but the posterior one did not. The pressures were moved to the lateral compartment. The plate placed anterior shifts to the posterior compartment. The cupola as described by Dejour can be weight relieved.

The use of a high tibial osteotomy in revision ACL reconstruction. Roland Biedert.

The hypothesis was that an osteotomy may be necessary for a successful ACL revision reconstruction. 10 patients in study did not have significant medial compartment osteoarthritis. He used BTB, hamstrings, and quads tendon.

Biedert switched to the open wedge osteotomy from lateral closing wedge during the study. The function improved, and the pain decreased. IKDC subjective score improved to 92. Only 70% had normal single leg hop. Most patients moved up at least one to 2 grades on the IKDC evaluation.

The varus knee puts more strain on the graft. In revisions, the osteotomy reduces the varus, and internal rotation, as well as shear on the medial side. The plate should be placed posteromedial.

Multiple Ligament Injured Knee – Symposium

Acute ACL/MCL – Clatworthy

The indication for operative repair of the ACL/MCL is a knee that is unstable in extension. The timing for repair is 10-14 days with 90* flexion.

MRI should be done to assess level of tear.

If the knee is stable in extension, then physio should be prescribed, and do an ACL recon in 8 weeks. He uses HS for ACL recon.

The discussion brought out the point about the site of the tear, and especially the posterior oblique ligament. Distal tears do not do as well as proximal tears.

What to do about the MCL? Chris Wahl

Does the MRI help? MRI and Shino in AJSM 2003

Shino found that most tears on the femoral side heal. Shelbourne has recommended to do only ACL recon, and allow the MCL to heal.

Complete superficial injuries will not heal. Millet and Steadman AJSM 2004 recommended repair early.

Chronic ACL and MCL – Christel

Clinical exam is important to determine the grade of the MCL.

Plain x-ray and stress x-rays also add information.

Standing x-rays should be done for chronic cases to evaluate the alignment.

If you do the osteotomy, 50% will not need the soft tissue operation.

MRI should be done to assess the meniscus and cartilage

There are several procedures described for the chronic reconstruction of the MCL.

Advancement/recession of MCL – Jacob

Augmentation with semi-t Neyret

Augmentation of POL – Lemaire

It is well described that the MCL deficiency can lead to laxity of the ACL graft.

If the medial laxity returns to normal after the ACL recon, no need to recon the MCL. If there is persistent laxity after the ACL then must do the MCL. (I think that you have to make up your mind before the ACL reconstruction.)

Cristel uses the BTB for the ACL, and the HS for the MCL

The choice of the procedure depends on the site and quality of tissue.

Use reefing if good tissue, and augment if poor tissue.

He uses brace and crutches post-op, with slow ROM.

Yoshiya 2005.outcome were average.

Jurgen spoke of the “claw” to microfracture the MCL for the chronic grade 2 injuries. He then limits ROM in extension.

Single Achilles Allograft MCL/PCL Reconstruction (SAMP) Chris Wahl

This is the Achilles allograft used for transtibial PCL and brought out the femoral tunnel for an MCL reconstruction. He puts the bone block at the proximal end of the tibial tunnel.

Multiple ligament injuries with fracture of the fibular head. Andy Williams

The fracture of the fibular head may entrap the peroneal nerve after it is pulled up proximally, and trapped in the fracture site. Reduction of the fracture may damage the nerve. Beware of the proximal fractures.

Effect of Pre-operative cooling on central knee temperature. Hans Pessler

Does pre-op cooling lower the knee temperature? The hypothesis was that the temperature would be reduced.

Spindler measured the temperature in the suprapatellar pouch, and found the temp decreased by 7*.

Cooling can also be done by cooling the irrigating fluid. – Morris.

Does pre-op cooling work? This studied was with menisectomy and ACL reconstruction with 1 hour of cooling in the pre-op room.

The patients were randomized into control and study group in each category. He used physitemp instrument to measure the skin temp above the patella. The IA was measured at the beginning and end of the procedure in the notch, gutters, and the pouch.

Results: average reduction of temp by 5*, significant reduction from pre to post. The meniscus showed significant reduction, but the ACL group did not show this. The conclusion was that this 1 hour of cooling reduced the pain post-op.

Upcoming Meetings

- **AANA Spring Annual Meeting** Hollywood Florida May 17-21, 2006
contact www.aana.org
- **Esch Shoulder Course June 21-24, 2006. San Diego CA**
Contact www.shoulder.com
- **AOSSM Annual Meeting 29 June-7 July, 2006. Hershey PA**
contact www.aossm.org

