

EFORT LUNCH SYMPOSIUM PROCEEDINGS

Current Challenges in Joint Arthroplasty and Possible Solutions



Barcelona, Spain, 31 May 2018

Preservation in motion

Table of Contents

This summary is based on the presentations given during the Mathys lunch symposium in Barcelona, Spain on 31 May 2018. The content reflects the presenters' professional experiences and personal opinions.



Symposium report

- Welcome 4
- Hip 5
 - Cemented versus uncemented stems: What we should be aware of! 5
 - Key features of a well-cemented stem: Operative technique and radiological criteria..... 8
- Shoulder..... 11
 - Primary RSA: A complex procedure if done correctly 11
 - Prosthetic design can improve clinical results in RSA! 13
- Knee 15
 - Patient satisfaction and objective outcome in TKA: Implant design and instrumentation – does it really matter? 15
 - The newly developed balanSys® TKA instrumentation..... 17

Biographies

- Biographies 19

Symposium Proceedings

Welcome

During the 2018 European Federation of National Associations of Orthopaedics and Traumatology (EFORT) annual meeting in Barcelona, Spain, Mathys hosted a lunch symposium that focused on the current challenges, and possible solutions, in joint arthroplasty.

The audience was welcomed by chairman Andreas Niemeier, who began by relaying the aims of the lunch symposium. First, he said, would be to provide an overview of important topics in hip, shoulder and knee arthroplasty, including the challenges faced in

day to day practice. In addition, there would be presentations detailing the specific advancements that Mathys is working on to provide effective solutions to these challenges in all three joint areas.

Joining Professor Niemeier were four esteemed experts in the fields of hip, shoulder and knee arthroplasty, who all took to the podium to share their insights in a packed auditorium.



HIP

Cemented versus uncemented stems: What we should be aware of!



Karl Stoffel
Professor, MD, PhD – Basel, Switzerland

The first presentation of the day was delivered by Professor Stoffel, who offered an update on the current knowledge base in uncemented and cemented stems, with particular emphasis on their associated costs, complications and long-term durability. He began with a focus on the economic aspects of both stems, relaying study data (Bone Joint J. 2013;95-B:874–6) showing that the major drivers of cost are attributable to inpatient care and hospital length-of-stay, not the choice of implant.

That being said, another study (BMJ. 2013;346:f1026) revealed that cemented prostheses were the least costly choice in total hip replacement, while hybrid prostheses were the most cost *effective*.

Diving into the complications associated with cemented stems, Professor Stoffel touched on bone cement implantation syndrome (BCIS) – a loosely defined condition with clinical features that may include hypoxia, hypotension, cardiac arrhythmias, increased pulmonary vascular resistance and cardiac arrest (BJA. 2009;102:12–22). He added that it usually occurs at one of several key stages during total hip arthroplasty (THA): femoral reaming, acetabular/femoral cement implantation, insertion of the prosthesis or joint reduction. Crucially, BCIS is associated with an intraoperative mortality of approximately 0.1% (primary THA) to 0.7% (THA with tumour).

In order to reduce BCIS risk, a number of anaesthetist- and surgeon-led measures should be emphasised, continued Professor Stoffel. First, open communication between surgeons and anaesthetists should be encouraged, particularly in terms of informing anaesthetists when cement is about to be inserted. Furthermore, blood pressure monitoring should be used to stay vigilant for signs of cardiorespiratory compromise. After cementing, it is advisable to aim for a systolic blood pressure within 20% of pre-induction values (Anaesthesia. 2015;70:623–626).

From a surgical perspective, the femoral canal should be washed and dried effectively, cement applied retrogradely (with a suction catheter at the bottom of the femoral canal) and excessive pressurisation should be avoided, especially in the sickest patients.

Continuing on the theme of complications, Professor Stoffel turned his focus to periprosthetic fracture rates, whereby data show that there is a four-fold higher fracture rate for uncemented versus cemented stems in the immediate intraoperative period after implantation, with the prevalent risk factors being female sex and age over 65 years (Bone Joint J. 2016;98-B:461–7). After 20 years, uncemented stems continued to be associated with higher periprosthetic fracture rates, but there was no longer any difference in fracture risk across genders.

Looking at revision surgeries (Bone Joint J. 2016;98-B:468–74), while fractures were three times as likely in uncemented stems versus cemented stems in the early intraoperative phase (independent of gender/age), interestingly, longer-term follow-up out to 20 years established no significant differences between uncemented/cemented stem fractures.

“Taken as a whole, the risk of intra-/postoperative fractures is significantly higher if using uncemented stems,” said Professor Stoffel.

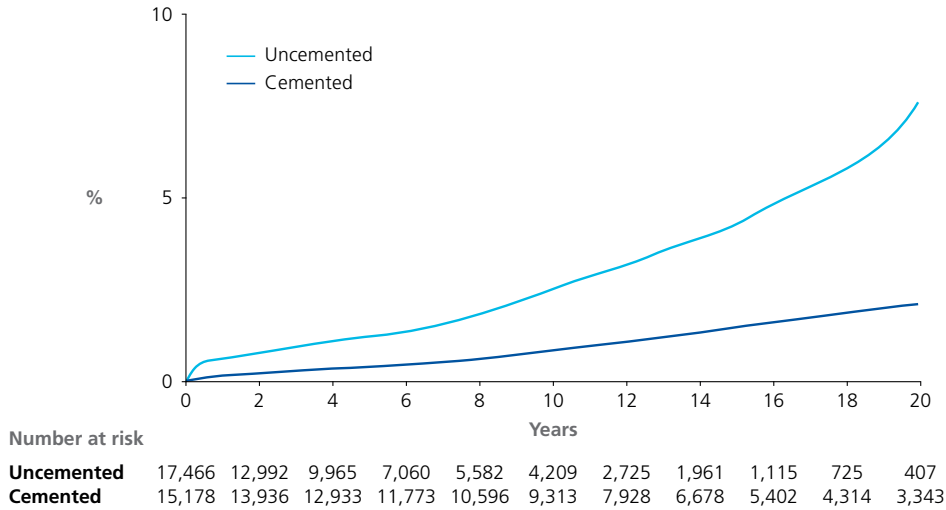
For the final metric, long-term survivorship, he focused on data from a comparative literature review (Clin Orthop Relat Res. 2013;471:2052–9) which gleaned that patients older than 65 years

had significantly higher rates of revision following uncemented fixations. Despite this observation, the proportion of patients in this age group receiving uncemented versus cemented stems increased from 2006 to 2010 – the so-called ‘uncemented paradox’.

Offering his conclusions, Professor Stoffel reiterated that cemented stems are more cost effective, have lower risk of periprosthetic fracture in primary THA (and even out to 20 years), and have better long-term survivorship, especially in patients older than 65 years. Uncemented stems in older patients, he added, have no supporting scientific data at this stage, and their use is mainly market driven, supported by surgeons emphasising minimally invasive techniques.



Periprosthetic fractures in primary total hip arthroplasty



Abdel MP, et al. Bone Joint J. 2016;98-B(4):461–467.

Challenges in cemented/uncemented stem fixation

| | Cemented stem | Uncemented stem |
|--------------------------------------|--|-------------------------|
| Cost | \$ | \$\$\$ |
| Intra- / postoperative complications | Bone Cement Implantation Syndrome (BCIS) | Periprosthetic fracture |
| Long-term survivorship | Lower revision rate* | Higher revision rate* |

*in patients over 65

Cemented stems:

- More cost effective
- Lower risk of periprosthetic fracture in primary total hip athroplasty, even after 20 years
- Better long-term survivorship, especially in patients >65 years of age

Key features of a well-cemented stem:
Operative technique and radiological criteria



Thierry Scheerlinck
Professor, MD, PhD – Brussels, Belgium

There is a wealth of evidence in the literature indicating that cemented stems can last decades without revision, Professor Scheerlinck began, with “very good” results seen even after 30 years in some follow-up cohorts. In reality, however, he cautioned that outcomes are much more wide-ranging, and will depend on a number of factors, not least surgical skill. “All cemented stems are equal, but some are *more* equal than others,” commented Professor Scheerlinck.

The importance of the cement mantle should not be overlooked, he continued, outlining Barrack’s cement classification system (J Bone Joint Surg Br. 1992;74:385–9) which grades the cement as:

- A – a “white-out”, in which no distinction can be made between the femoral cortex and the cement
- B – slight radiolucency at the cement-bone interface
- C – defective/incomplete cement mantle, radiolucency >50%
- D – poor cementing, failure to fill the canal with cement, 100% radiolucency

One of the factors that affects the quality of the cement mantle is how the broach is used, and how it

matches the stem shape/size. For example, if a canal-filling broach is utilised, one outcome will be an undersized implant with a thick cement mantle supported by cortical bone (Figure). When the implant size is equal to the broach, a thin cement mantle with cortical support can be achieved.

With a box-shaped broach, a lot of cancellous bone remains, thus a good cementing technique is paramount to achieve optimal filling of the canal. What should be avoided in such cases, stressed Professor Scheerlinck, is an implant surrounded by only a thin layer of cement, and with minimal cortical support.

Another key factor affecting the quality of the cement mantle is porosity inside the cement. Porosity weakens the cement, influences cracking and affects cement shrinkage during curing. However, many of these issues can be solved with effective vacuum-mixing practices.

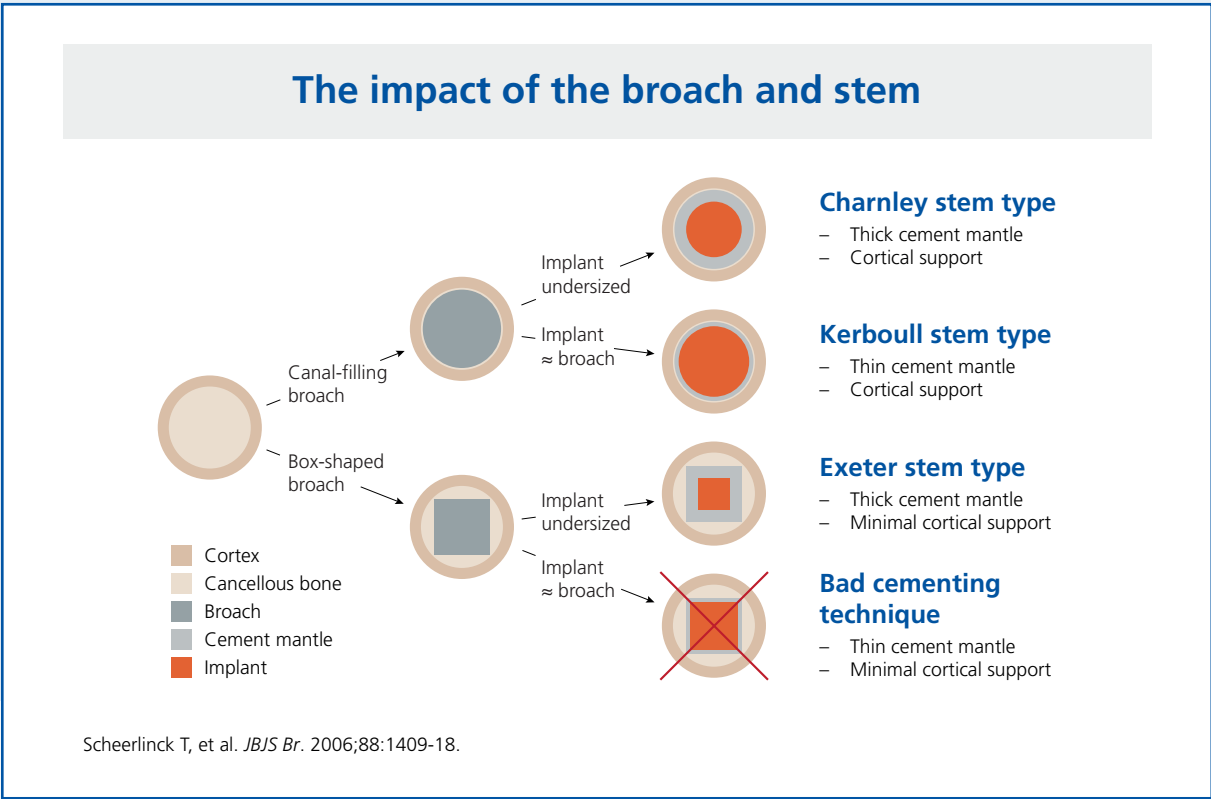
Defects at the stem/cement interface are less well known, continued Professor Scheerlinck. These interfacial gaps, while perhaps as small as 0.1–1 mm, can cover up to 30% of the stem area. Split between two types of defect (type I: interfacial porosity; and type II: interfacial gaps), their respective causes, and solutions, are different.

Interfacial porosity is due to shrinkage of the cement during polymerisation. In a traditional implantation, bone (around 34°C) is of a higher temperature than the implanted stem (room temperature, i.e. ~20°C). In such cases, the cement begins to polymerise from the warmer bone interface inwards, which results in shrinkage and interfacial porosity at the cooler cement–stem interface.

By using a stem heated to 40°C, polymerisation takes place from the stem outwards, meaning an interfacial porosity occurs at the cement–bone interface, which is much preferred. However, given the chance of thermal bone necrosis, a more sophisticated method to achieve

the preferred polymerisation direction is to cool the bone to below 20°C using cold pressure lavage, said Professor Scheerlinck.

Type II, interfacial gaps are caused by air introduced alongside the implant during stem insertion, but this can be minimised relatively simply. First, the stem should be inserted straight, thus lowering the chance of air being sucked in during insertion, and insertion should be done early in the cement curing process, thereby avoiding cement that is becoming too viscous, which could also increase the chance of air being trapped.



Pressure lavage is also very important, noted Professor Scheerlinck, particularly for cleaning fat and blood from the bone prior to stem insertion. Removing this excess fat also reduces embolic risk, he continued.

A final factor that can benefit the quality of the cement mantle is pressurisation. Here, the goal is to improve

cement interdigitation, favouring cortical support of the cement, and maximise the cement thickness in unsupported regions. Taking all these factors into account, and using a polished femoral implant, should result in excellent long-term outcome, Professor Scheerlinck said in closing.

Take-home messages

Cement stems work well in the long-term, but it is important to:

- ✓ **Manage cement porosity by**
 - Vacuum mixing
 - Cooling down the femur
 - Using straight stem insertion into runny cement
- ✓ **Pressure lavage to**
 - Favour cement interdigitation
 - Avoid fat embolism
- ✓ **Pressurise to**
 - Produce a thick cement mantle in unsupported areas
 - Favour cortical support of the cement mantle

SHOULDER

Primary RSA: A complex procedure if done correctly



Andreas Niemeier
Professor, MD – Hamburg, Germany

Patients undergoing arthroplasty in any joint expect good restoration of function, with no pain, but revision rate is also an essential criterion of success, especially in younger patients. The primary causes of failure in reverse shoulder arthroplasty (RSA), explained Professor Niemeier, are instability/dislocation, followed by infection, loosening and fracture.

He added that due to the evolution of RSA over the last 10 years, the drivers for revision have changed, with scapular notching – for instance – becoming much less of a problem more recently.

A core issue, continued Professor Niemeier, is that patients often present with a combination of factors that contribute to RSA failure – for example instability, infection, aseptic loosening and periprosthetic fracture – which, as the literature supports, can only be tackled with a limited set of strategies. Therefore, it is important to understand how to eliminate pain and restore function, and even prevent revision in the first place, he said.

The first key factor of success, he began, is patient selection. Data from the Australian Orthopaedic Association National Joint Replacement Registry demonstrated that no matter the primary diagnosis, revision rates due to osteoarthritis, rotator cuff arthropathy, fracture or rheumatoid arthritis were all similar up to 10 years. “We know, though, from other

data sources, that there is certainly a higher revision rate with fracture sequelae,” said Professor Niemeier.

He went on to stress that Boileau type III fractures – i.e. surgical neck non-unions – have a relatively high complication rate (41%; J Bone Joint Surg Am.2014;96:2070–6) and are particularly prone to dislocation. As such, certain patient populations could benefit from alternatives to RSA, such as open reduction internal fixation (ORIF), allografts and beyond. “RSA should not be done just because it is supposedly an easier procedure when compared to alternatives,” Professor Niemeier emphasised.

Nevertheless, if there are no reasonable alternatives available, it should be performed also in young individuals. Indeed, he shared a specific case example of a 55-year-old woman with chronically painful pseudoparalysis who, after soft-tissue and bone-stock analysis, showed clear indication for RSA with a bone graft. After 5 weeks, she was pain free, with excellent function.

“The open question, though, in the younger patient population is what impact RSA will have on function in the long run,” said Professor Niemeier, who outlined several keys to success that were gleaned from the aforementioned case. First was restoration of glenoid bone stock to prevent loosening, as well as glenoid joint line restoration to prevent instability.

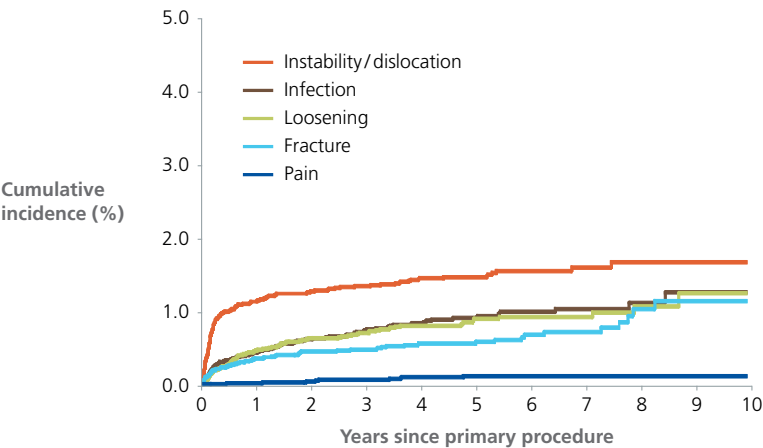
Metaglene fixation is also key if there is bone loss, he added. To that end, careful 3D preoperative analysis should be mandatory, with any detected bony defects being secured with central pegs or screws of appropriate size; more complex defects can be treated with patient-specific instrumentation wherever possible. In terms of metaglene positioning, placement too high can cause mechanical and/or biological notching, whereas placement too low can lead to excessive soft tissue tension, poor function or neurological damage.

Extensive resection of scar and bony fragments is also of high importance in preventing instability, with arm-length restoration (contralateral calibration) helping

Prosthetic design can improve clinical results in RSA!

Reverse shoulder arthroplasty: causes of failure

Cumulative incidence revision diagnosis of primary total reverse shoulder replacement



Source: 2017 AOA NJRR Registry Annual Report of >15,700 reverse shoulder arthroplasty procedures



Falk Reuther
MD – Berlin, Germany

Continuing the shoulder sub-session was Dr Reuther, who discussed how prosthetic design can improve clinical results in RSA.

Several studies have published implant survival rates in the region of 90% at 10 years, he began, but in younger RSA patients (<65 years), complication rates at 5–15 years are relatively high (37.5%; J Shoulder Elbow Surg. 2013;22:1199–208). The main complications include infection, late dislocation, scapula fracture and glenoid component loosening, along with other factors such as postoperative nerve palsy, early dislocation, soft tissue impingement, periprosthetic humeral fracture or wear of polyethylene (PE) coatings.

Systematic review data have shown that “problems” are seen in 44% of cases, with scapular notching rates as high as 52% (J Shoulder Elbow Surg. 2011;20:146–57). Similarly, a 73% scapular notching rate was also seen in a long follow-up of more than 150 months (J Bone Joint Surg Am. 2017;99:454–61).

Taking the landscape of data as a whole, Dr Reuther reasoned that the actual impact of scapular notching remains controversial, with different conclusions being drawn about the correlation between notching and clinical consequence.

In real-world practice, scapular notching can lead to screw breakage and subsequent loosening of the glenosphere, thus there is great interest in strategies that can minimise its occurrence, such as modified prosthesis positioning and design.

For instance, higher positioning at around 135–145 degrees has proved beneficial, as has a “sloped rim” approach. Furthermore, inversion of the prosthetic materials – i.e. a PE glenosphere and metal inlay – has been lauded in reducing PE wear (J Biomech. 2012; 45:469–73).

To reduce loosening of the glenosphere, Dr Reuther underlined the benefits of the Affinis® Inverse Reverse Shoulder Prosthesis System (Mathys). The device features a press-fit, CaP-coated eccentric metaglene, a PE glenosphere and a CoCr inlay, and is fixed with two lag screws and one angled stabilising screw. Dr Reuther added that by using a centric drilling guide, eccentric positioning of the glenosphere can be achieved, leading to reduced chance of mechanical notching.

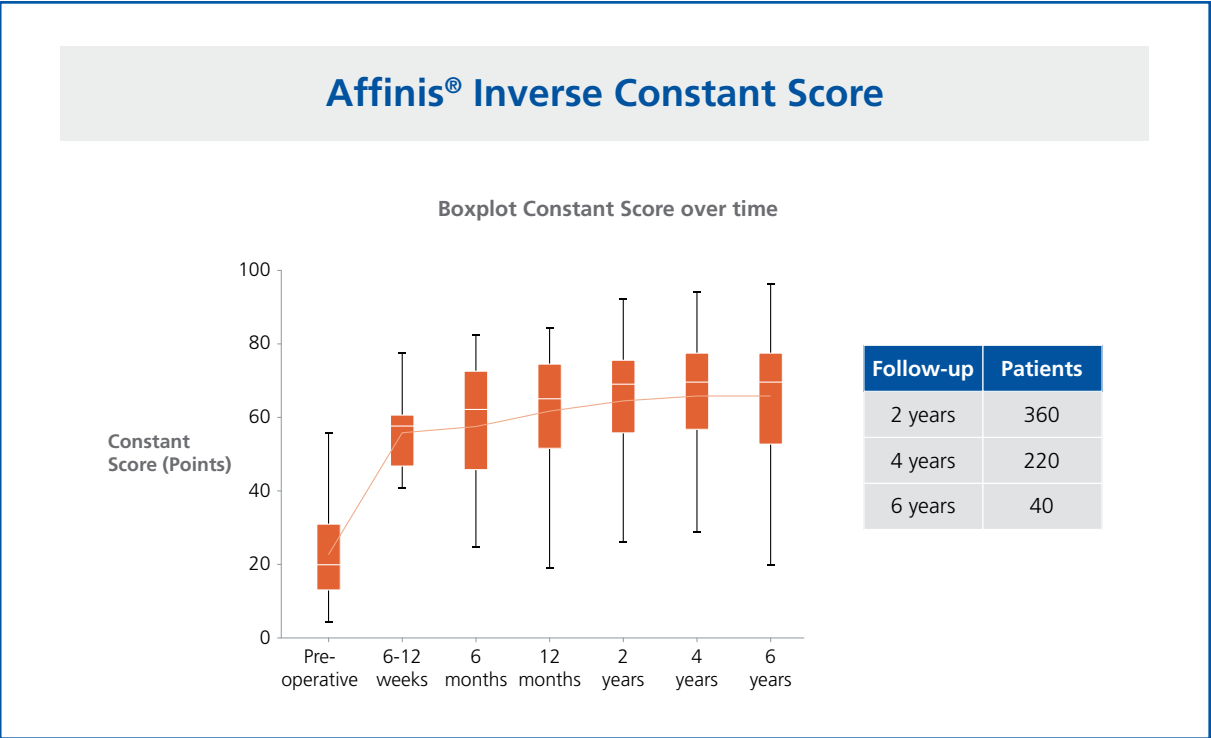
to guide – anatomically – the setting of the prosthesis. Finally, restoration of soft tissue tension should be pursued to combat instability and facilitate deltoid function.

Aside from patient selection, surgical approach and glenoid exposure and positioning are also important factors in primary RSA success, continued Professor Niemeier. With the supero-lateral deltoid-split approach, there is always a risk of superior inclination (leading to poor function and early loosening), thus the complete inferior glenoid should be exposed to avoid these problems. Glenoid positioning is also paramount to avoid notching.

Glenosphere size is a difficult situation that each surgeon faces, noted Professor Niemeier, but there is an extensive array of literature now available that focusses on how glenosphere size affects impingement-free range of motion, abduction strength joint load, deltoid force, rotator cuff tension, humeral lateralisation, notching and revision rates.

He went on to state that humeral positioning and arm length are not always easy to assess, especially in cases of post-traumatic metaphyseal bone loss, and intraoperative assessment of soft-tissue tension is also difficult. However, corrections can be made using meticulous resection of posterior scar/bone fragments, and deltoid tensioning by liner exchange can be utilised for restoration of arm length as needed.

In summation, Professor Niemeier underlined that RSA is not a quick and easy operation, reaffirming that all of the considerations discussed are key in achieving durable success in the longterm. “We do see worse results after each revision – which stands to reason – and that is why we definitely need to try and get it right the first time,” he said in closing.



Cutting-edge updates to devices are also intriguing, said Dr Reuther, including Mathys’ combination of ceramic inlay (Ceramys®) and vitamin E-enriched, highly crosslinked PE glenosphere (vitamys®). Used in combination, there is 80% less *in vitro* wear when compared to traditional prostheses, he reported (Data on file; Mathys Ltd Bettlach).

Dr Reuther went on to introduce an ongoing prospective, consecutive, multicentre study evaluating notching rates in a total of 245 RSA patients implanted with Affinis® Inverse, with follow-up scheduled at 3, 6, 12 and 24 months, and 2 years thereafter until at least 10 years. (Arch Orthop Trauma Surg 2015, 2: 161–169)

Sharing the results thus far, he noted that Constant scores remained stable from around 6–12 months out to 6 years (maximum current follow-up). Complication and revision rates were impressive, at 5.4% and 3.4%, respectively.

Looking at notching results, 69.6% had no reported notching (Grade 0). Grades 1 and 2, corresponding to mechanical notching, were established in 23.2% and 4.0% of patients, respectively. Grades 3 and 4 – i.e. biological notching, driven by PE wear – came in at 3.2% and 0%. Average follow-up was 49.1 months (range: 36.4–59.9 months). Drivers for notching greater than Grade 1 included acromion fracture, high implantation of the metaglene, size of the glenosphere (36, 39 and 42 mm) and prosthesis–scapular neck angles that were too high (99–107°).

Noting his conclusions, Dr Reuther commented: “Scapular notching is not always possible to prevent, despite improvements in prosthesis design and surgical technique.”

He added: “However, mechanical notching does not influence or deteriorate clinical results in follow-ups of 6–8 years.”

KNEE

Patient satisfaction and objective outcome in TKA: Implant design and instrumentation – does it really matter?



Roland Becker
Professor, MD – Brandenburg, Germany

Professor Becker tackled patient satisfaction and objective outcomes in total knee arthroplasty (TKA), walking the audience through several key considerations, including surgical prowess, innovations in knee surgery, how to measure clinical outcomes, patient-related factors and expectations.

His first discussion point pondered just how accurate surgeons and their instruments can be. For instance, aiming for the epicondylar axis in surgery may be rooted in good practice, but studies have now shown that significant variation in both the antero–posterior and proximal–distal planes occur in real-world outcomes, affecting both rotation and leg alignment. Similarly, sizing variations in tools such as sawblades – although seemingly minute – can have an impact on the accuracy of resections. “If you add all of these variations together, it can become very scary,” he said.

Of course, innovative technologies such as navigation systems, patient-specific instrumentation (PSI) and robotics do hold some of the potential in improving surgical accuracy and reproducibility, continued Professor Becker. PSI, for example, has been shown to reduce operating theatre time by up to 20%, as well as improving implant positioning, and reducing femoral component malrotation when compared with standard surgery. However, it offers no apparent benefit for mechanical alignment or component placement, with Professor Becker arguing that the important clinical outcomes are unaffected.

Notably, he added that PSI could not reach its full potential without also placing more emphasis on patient-specific prostheses. The site, diameter and axis of rotation of a knee and its implant should reflect the individual characteristics of each patient, he said.

Surgical robots offer excellent precision, continued Professor Becker, but their high costs need to be weighed against tangible clinical benefits that the technology may bring. What’s more, particular care has to be taken to optimise results, and bone morphology and soft tissue should be respected.

Patient-related factors that affect outcomes include obesity, age, sex (inferior outcomes in females), as well as psychosocial aspects such as depression, and residual pain. None of these are surgical factors, but they have a significant impact on clinical outcomes after TKA, stressed Professor Becker.

Moving on to outcome measures after TKA, he relayed the typical metrics used, including the Knee Society Score (KSS), Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) and Hospital for Special Surgery score. The most objective measures, he added, include Short Form Health Survey (SF-36) self-evaluation forms, Knee injury and Osteoarthritis Outcome Score (KOOS), and the new KSS.

Professor Becker shared that “excellent” results were generally seen after 85–90% of surgical TKAs, yet outcome analyses from the largest health insurance companies indicate that 20% of patients are not entirely happy. “What does this mean?” he said, cautioning that these types of unspecific outcome metrics do not necessarily have any link to the overall success of the surgery.

Nevertheless, he reasoned that there should be more awareness of just what expectations patients have when embarking on their surgery. And the results may surprise a lot of people: 20% of patients will assume no limitation whatsoever after their surgery, and 52% will expect no functional limitation.

To delve deeper into patient perspectives following surgery, Professor Becker and colleagues initiated a prospective study in which 102 TKA patients were quizzed both before and after their surgeries to ascertain if their initial expectations were fulfilled. Modified KSS, WOMAC and SF-36 measures were utilised.

Results uncovered that 71.7% of patients were satisfied in terms of ‘pain reduction’ and their ‘ability to walk’, while 65.2% were satisfied by their ‘improvement of limping’ and ‘improvement of squatting’ outcomes. There were no correlations based on family status, sex, age or body mass index.

Furthermore, no differences were found between posterior stabilised (PS) and cruciate retaining (CR) total knee prostheses, nor between conventional surgery and computer-assisted surgery, or surgical technique in general.

“Are our tools that we use for patient evaluation inappropriate?” questioned Professor Becker. “Or are there other factors that may have significant impact on clinical outcome?”

Wrapping up his main messages for the audience, Professor Becker noted several conclusions. First, it is clear that new technology does provide improvement in surgical accuracy, even if it cannot readily improve clinical outcomes. Second, a combination of measured resection and ligament balancing technique is a key goal that should be pursued.

In addition, he summarised that outliers in alignment and component placement are significantly reduced, the impact of a patient’s anatomical individuality could be important, but as yet remains unclear, and finally, we should be more mindful of the psychological factors that might affect patient outcomes.

7 surgical keypoints for success in TKA

- 1. Mechanical alignment
- 2. Restoration of the joint line
- 3. Ligament balancing
- 4. Equalisation of the extension and flexion gap
- 5. Correct component placement
- 6. Restoration of the patellofemoral joint
- 7. Preservation of patella mobility

The newly developed balanSys® TKA instrumentation



Andreas Niemeier
Professor, MD – Hamburg, Germany

In the last presentation of the day, symposium chairman Professor Niemeier returned to the podium to discuss Mathys’ balanSys BICONDYLAR prosthesis – an established device that has now had more than 20 years of experience in the TKA marketplace. The device is available in four key designs, spanning cruciate-

retaining (CR), ultra-congruent (UC), posterior-stabilised (PS) and rotating-platform (RP) variants.

The prosthesis has a single-radius design, with enhanced stability throughout its -20° to +90° range of movement (ROM). Featuring a posterior referencing system, it has a constant flexion gap that is independent of femoral component size. The anterior flange is angled at 5°, leading to reduced risk of notching of the anterior cortex when downsizing, and the femoral shield has a wide Q angle that facilitates patellar tracking, and allows a larger radius in extensions, and a small radius in flexion. The device also features deep patella grooves that are designed to reduce anterior pressure and lower the risk of subluxation, and an elongated anterior flange offers stable tracking in extension.

In an Australian Orthopaedic Association (AOA) study (AOA NJRR Annual Report, 2017) the cemented balanSys BICONDYLAR was associated with a 4.2% revision rate at 10 years, compared with 5.3% across all cemented bicondylar TKAs. Similarly, the Swiss

Tibia Resection System (TRS)



BIOGRAPHIES

Implant Registry reported lower rates of revisions per 100 component-years when using all four balanSys BICONDYLAR variants (combined average, 0.778), compared with the average rate for all other implants (1.3).

Orthopaedic Data Evaluation Panel (ODEP) ratings for the device are also excellent, commented Professor Niemeier, with 3A* rankings for the UC, PS and RP variants, and 7A* for CR. "They are on a good track to receive a 10A* rating in the future," he said.

Professor Niemeier went on to introduce several new updates to the balanSys BICONDYLAR. These include the new leggera (Italian for 'light') instrument set, implementation of the vitamys® inlays (vitamin E-enhanced, highly cross-linked polyethylene) and refined height increments for the inlays.

The leggera instruments feature the Tibial Resection System (TRS), which facilitates a smooth, quick, adjustable and reliable fixation, without the need for screws. The TRS can be used to alter both the primary and fine-tuning adjustments of the tibial slope, varus/valgus angle and tibial height.

"Avoidance of the patellar tendon is another very nice feature," continued Professor Niemeier, who added that the femur resection process has evolved too. With an intramedullary rod, and an attached mechanism for femur valgus angle, the feature allows the surgeon to adjust and secure the distal femoral valgus angle once the rod is in place. With posterior referencing paddles, it includes femur rotation dialling and anterior cut dialling; spacer blocks can also be used before or after resections.

The guided tibia preparation now available is also definitely an upgrade from previous versions, said Professor Niemeier, and is more stable. What's more, a multifunctional trial inserter has also been implemented, which can be sized in 1 mm steps. Finally, a more ergonomic and streamlined range of tool sets completes the package.

All told, the new updated instrumentation available with balanSys offers improved surgical workflow, said Professor Niemeier, and the system as a whole hopes to improve future clinical results and survival rates.



Andreas Niemeier
Professor, MD
Hamburg, Germany

Andreas C. Niemeier, University Medical Center Hamburg-Eppendorf, Germany, is an academic orthopaedic surgeon with long-standing experience in primary and revision arthroplasty of the hip, knee, shoulder and elbow.

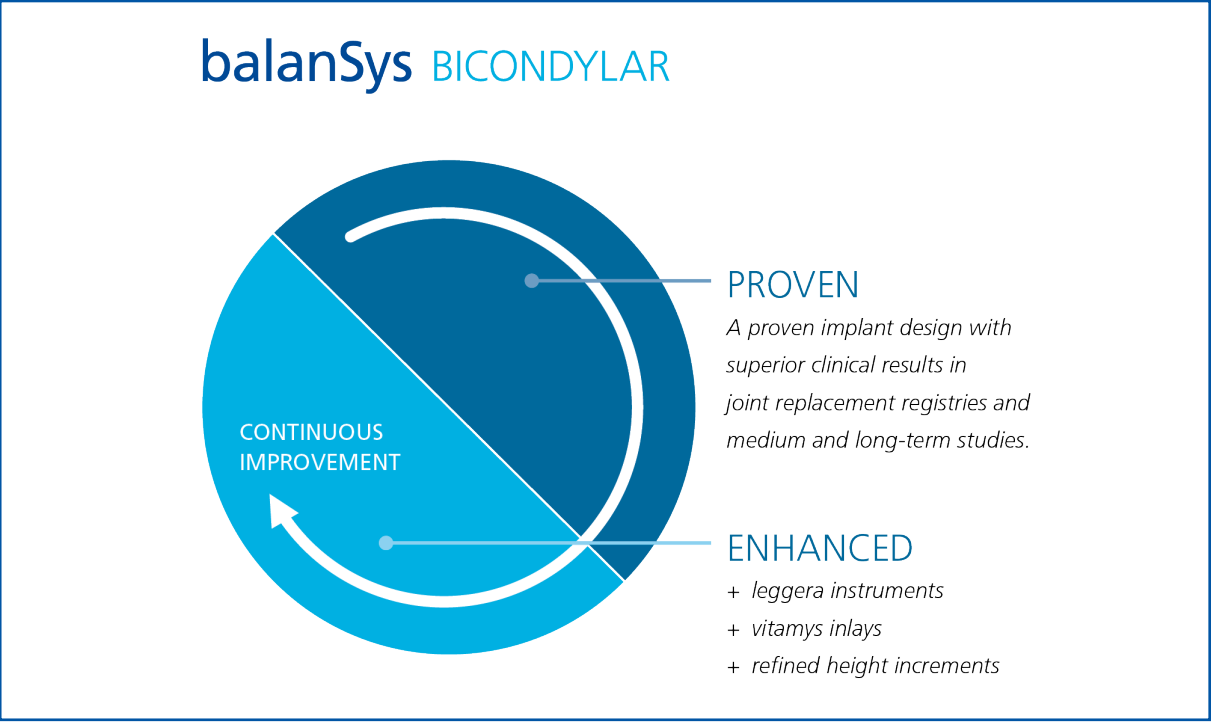
Professor Niemeier is a member of numerous national and international professional societies, he reviews for numerous prestigious journals in the field, is widely published and enjoys teaching at all levels of experience, from students to professional education and expert exchange. His research interests include basic and translational research in bone metabolism as well as the clinical outcomes of total joint replacement of the upper and lower limbs.



Falk Reuther
MD
Berlin, Germany

Falk Reuther is Head of the Department of Traumatology and Orthopaedics at the DRK Kliniken Berlin Koepenick, Germany. Dr Reuther trained at the University of Greifswald [Ernst-Moritz-Arndt], Germany and completed fellowships in countries around the world including Australia, Austria and Germany. Dr Reuther has contributed to numerous congresses such as the Shoulder Arthroplasty Congress in 2010 and 2015. Additionally, he served as President of the annual congress of the German Association for Shoulder and Elbow Surgery (DVSE) in 2012.

Dr Reuther is also a member of many German and international associations including the German Society for Arthroscopy and Joint Surgery (AGA), the German Society for Surgery (DGCH) and the European Society of the Shoulder and Elbow (ESSSE).





Thierry Scheerlinck
Professor, MD, PhD
Brussels, Belgium

Thierry Scheerlinck is Head of Department of Orthopaedic Surgery and Traumatology at the Universitair Ziekenhuis Brussel and Professor of Orthopaedic Surgery and Traumatology in the Faculty of Medicine and Pharmacy of the Vrije Universiteit Brussel, Belgium. Professor Scheerlinck trained at the same University he is now working at, and completed a number of research projects in diverse sub-specialities of orthopaedics: adult, geriatric and child traumatology, anterior cruciate ligament reconstruction surgery and more recently on the use of imaging technologies in hip arthroplasty surgery.

His PhD thesis research focused on the cement mantle of cemented femoral hip implants. As an author or co-author of several book chapters and numerous peer-reviewed publications, Professor Scheerlinck has made great contributions to the field of hip arthroplasty. Additionally, he has been involved in the organisation of international congresses and has given numerous presentations. Professor Scheerlinck teaches on the locomotor system, as well as on orthopaedic surgery and traumatology.



Karl Stoffel
Professor, MD, PhD
Basel, Switzerland

Karl Stoffel is Professor of Orthopaedic Surgery at the University of Basel and Deputy Head of Orthopaedics and Traumatology, Kantonsspital Baselland, Switzerland. He also spent a number of years working in orthopaedic surgery at the University of Western Australia, where he completed his PhD in Biomechanics. Professor Stoffel is still actively involved in research at institutes in Australia and Switzerland. He is a member of a number of national and international societies, including the Royal Australian College of Surgeons (RACS), Australian Orthopaedic Association (AOA) and the Swiss Orthopaedic Association (FMH). As well as three book chapters, Professor Stoffel has authored or co-authored over 60 peer-reviewed publications. He has also presented extensively at various congresses, with nearly 200 abstracts and invited lectures.



Roland Becker
Professor, MD
Brandenburg, Germany

Roland Becker is Medical Director of the Hospital Brandenburg, Germany. He trained at the Otto von Guericke University of Magdeburg, Germany, and completed fellowships in Pittsburgh, Boston and San Antonio (USA). Professor Becker has also worked in orthopaedic departments at hospitals in the UK and Switzerland.

Professor Becker is a member of numerous societies; he has recently been President of the European Knee Associates (2014–2018), and from 2011 to 2013 served as President of the German Society for Arthroscopy and Joint Surgery (AGA). He is Deputy Editor in Chief of the journal *Knee Surgery Sports Traumatology and Arthroscopy*. During his career, Professor Becker has published over 100 papers and given over 400 oral presentations.

Professor Becker’s current research interests include meniscus healing (also the subject of his PhD), total knee arthroplasty, the study of muscle function and analysis of the pivot shift of the knee.

NOTES

