My interest in cementless Total Hip Arthroplasty began in 1993 when I was introduced to the experimental PCA-Howmedica system while visiting Dave De Young at NCSU Veterinary College. After previous experience with cemented prostheses, I was looking for a commercially available cementless system to eliminate the complications I had encountered with cemented hips, mainly aseptic implant loosening and implant failure. While visiting the Veterinary School in Zurich in 1995, I had the opportunity to work with Pierre Montavon and Slobodan Tepic during their initial studies on the original ‘Zurich’ cementless THA. I started using this technique in my own hospital in 1997. Fascinated by the high-tech original features of the system, I convinced the inventors to extend the clinical application of the ‘Zurich’ cementless THA to selected veterinary institutions to undertake an international multicentre study. The feed-back we received from that global clinical study, which included short- and long-term evaluations, allowed improvements of the first generation of implants to produce more efficient second and third generation implants. The ultimate proof of validity of a THR system is its ‘survival’ when applied to a large number of patients worldwide.

**Kyon Hip Prosthesis**

The Kyon hip prosthesis, also known as the “Zurich cementless total hip arthroplasty”, was the first cementless THA prosthesis introduced to the veterinary market 13 years ago. In this system, immediate fixation of the cup is provided by a press-fit insertion, and long-term stability is achieved by bone in-growth through the holes in the cup surface. Locking screws are used for immediate fixation of the stem, and in-growth of bone along the rough titanium surface of the implant provides long-term stability. The Kyon cup is made of pure titanium and the Kyon stem, head and neck unit and screws are composed of titanium alloy. Of 1053 Zurich cementless THA operations carried out at our hospital from 2001 to mid 2011, complications (one or more) occurred in 10.5% of cases. Of these complications, 91% were successfully revised and 9% (1% of the total population) required explantation of the prosthesis. The type and incidence of complications associated with THA were time-related; luxation, fracture and early cup loosening usually occurred within six months of surgery (short term), whereas other complications including stem loosening, late cup loosening and implant breakage occurred later on (long term). The likelihood of encountering long-term complications increases with time. Thus, long-term complications are more likely seen in cases that are followed for extended periods of time. In the last two years, our complication rate dropped from 10.5% to 6.0%, but the next few years will tell us the definitive percentage. Although the surgeon always strives to minimize complications, a major advantage of this surgical technique is the feasibility of successful surgical revision if complications do occur.

**One problem, one solution**

I am very confident in the Kyon hip prosthesis system because of the company’s drive for continued improvement of their product and their commitment to finding technical solutions for all problems that arise. As soon as the reliability of the second generation of implants had been established in 2004, I encouraged my clients to choose this treatment option, and in 2005 we carried out more than 100 THAs, and in subsequent years had an average of 130 THAs per year. We encountered both short- and long-term complications, all of which could be solved. Luxation was the most common short-term complication, mainly in large- and giant-breed dogs, and the introduction of a larger head led to an immediate reduction of this problem. Aseptic cup loosening...
because of polyethylene debris diffusing onto the back of the hydraulically open cup was a long-term complication observed in a few cases. A new double-shell cup that isolated and supported the polyethylene with an inner titanium shell solved that problem. More recently, amorphous diamond coating of the heads to reduce the coefficient of friction and further minimize the polyethylene wear was implemented. Implant breakage was observed in middle-aged dogs that were implanted with small implants while still growing; the solution was to use bigger implants in skeletally immature dogs and to increase the size and strength of the stems with a micropinning treatment. Cup loosening was a short-term problem attributable to various causes, such as poor press-fit, low-grade infection or premature loading, but it could also be a long-term problem caused by polyethylene debris or cup breakage. Cup loosening was successfully resolved with a surgical revision by using a specifically designed revision cup consisting of a disassembled cup with an outer shell that can be fixed with several screws to achieve immediate stability, and an inner shell that is placed inside the outer shell.

How to reduce complications

To better understand why complications occurred and to prevent them, we adhered to precise record keeping, which included all the information about the implants used and their orientation, and yearly follow-up examinations of all our THA cases. THA is a life-long treatment and only regular physical and radiographic follow-up examinations can demonstrate the survival and persistent osteointegration of the implants. From these follow-up examinations we learned how to address the problems associated with implant survival and to improve the implants and the technique. The THA surgical technique is unforgiving of technical error and requires extreme precision and consistency. Once the surgical technique is fine-tuned to yield optimal results, it must be repeated precisely and consistently to achieve a good and reliable outcome. In our experience, the most important surgical tips for a successful Kyon THA are: ensure precise acetabular reaming to achieve strong cup press-fit; oversize the implants in growing dogs for longer survival; limit the use of small cups (21.5 mm and 23.5 mm) to small dogs to avoid excessive polyethylene wear that may occur when small cups are used in bigger dogs; use the biggest stem possible to achieve maximal strength; use the shortest head and neck unit to reduce the lever arm; and check the luxation tendency during surgery with the pull-test and the range of motion test. For dogs with a higher risk of femoral fracture (geriatric dogs, very severe DJD, dogs with femoral osteopenia and overweight dogs), the use of a buttress plate as a preventative femoral protection is strongly recommended.

Life-time guarantee

We have offered a life-time guarantee to our clients for a number of years to boost confidence in this surgical procedure. The guarantee is honoured when the owner has completed the required re-checks (2 and 6 months post-operatively and then yearly). Provided that these terms are met, all surgical revisions are free of charge, except for luxation, for which we charge a reduced fee. Based on a calculated risk for surgical revisions of 10%, half of which are due to luxation (and thus, are not managed for free), and a quarter to implant failure, which are reimbursed by Kyon, this leaves a quarter of all revisions, or 2.5% of the entire patient population, to be re-treated at our own expense. However, we feel that we are well compensated for this by the income generated by the annual follow-up examinations.

Challenging cases

Confidence in this surgical technique has allowed us to successfully manage challenging cases that have a high risk of failure or complications, such as hip luxation associated with limb deformity, unsatisfactory femoral head osteotomies, unsatisfactory triple pelvic osteotomies and
malunion of acetabular fractures. Last January, I had the extraordinary opportunity to carry out a
THA using a custom-made Kyon cementless prosthesis in a Malaysian Tiger at the University of
Leipzig in Germany. Now, one of the last 500 living Malaysian tigers with a degenerated hip is once
again enjoying freedom and full activity in her environment.

What I have learned after my first 1000 THAs

I have learned to be very precise and consistent in my record keeping and in regular follow-up
examinations, to fine tune the surgical technique and to repeat it consistently in every case, aiming
for consistent orientation of the implants. I have learned to remember that THA is an unforgiving
surgical technique and that every case should be done as precisely as possible; an exact check-list
must be followed - there is no room for improvisation. Aiming for consistent and perfect execution
every time is the best way to prevent annoyance in a routine procedure. Finally, I am always
prepared to face complications and solve them without being stressed.