

## PETER VERDONK

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### SUMMARY

Professor Peter Verdonk's trajectory from Ghent to Antwerp, via a pivotal fellowship in Lyon, reflects a career-long commitment to deciphering knee biomechanics. Born into a multi-generational medical family, he transitioned from neurosurgery to orthopedics, focusing on meniscus preservation and ligament reconstruction. His research emphasizes identifying patient-specific morphotypes to predict surgical outcomes, moving beyond generalized techniques. As a leader in Belgian and international societies, he advocates for clinical precision and rigorous data, mentoring the next generation toward individualized, evidence-based practice.



From his training in Ghent to his innovations in Antwerp, including his significant experience in Lyon, Peter Verdonk shares his journey and how he shaped his practice. As a specialist in meniscus and anterior cruciate ligament surgery, he advocates for a tailored approach and emphasizes the importance of research. His philosophy? Combining technical precision with a deep understanding of each patient to push the boundaries of surgical excellence.

### Peter, can you tell us about your background, where you were born and raised?

I recently turned 50. I was born and raised in Ghent, Belgium. I pursued my medical degree at Ghent University, which felt like the only path for me given my family's extensive medical background. Both my parents were doctors, as were their parents and grandparents, so medicine seemed logical. Initially, I was drawn to neurosurgery, but I soon realized my attention span wasn't quite suited for it. Moreover, I observed that many neurosurgery patients didn't necessarily improve post-surgery. That's when I turned to orthopedic surgery. It's one of the few medical disciplines where patients often experience significant improvement. There's something incredibly gratifying about seeing patients who come in with limited mobility leave with restored function, especially in knee surgery.

## What influenced your decision to specialize in orthopedic surgery? Was there any pressure from your father, René?

Interestingly, one of the best aspects of my journey was the absence of pressure from my parents. Neither my father nor my mother, who was a microbiologist, pushed me towards medicine or orthopedics. I remember the moment I realized orthopedics might be my path and feeling nervous about informing my dad. I think he also had a moment of concern, realizing the responsibility that came with my choice, but he handled it very wisely. As I began my training as an orthopedic resident, my wife was pursuing her Ph.D. in the Netherlands. Initially, I planned to do a year or two of residency there, but fate had other plans. Unable to secure a position in the Netherlands, I ended up in Roeselare, in the West Flemish area, which was as far as possible in the opposite direction of my wife. It was there that I truly caught the “virus” for knee surgery. My first mentors, Luc van den Daelen and his partner Paul Gunst, really ignited my passion for it.

So, although my father was obviously in knee surgery and my entire family was in medicine, it was these external factors that led me to follow a similar path. It wasn't a push from my dad; it was more of an intrinsic motivation. But it could also be that blood is thicker than wine!

## Can you tell us about your PhD journey?

Pursuing a PhD was a clear and well defined step in my path. In Europe, if you want to excel in the academic world and be among the best, a PhD is essential. It's a huge sacrifice, and that's an important message for the younger generation following us. I began my PhD in 2001 under the guidance of Prof Verbruggen, focusing on stem cells, which had only been first described in 1999. I was the first orthopedic surgeon in our institution to look at these cells under a microscope, a far cry from our day-to-day surgical work. We were trying to coax these cells into becoming articular cartilage, which was incredibly challenging.

Two years in, we hit a roadblock. The cells were producing both type 1 and type 2 collagen, with type 1 being undesirable for our purposes. I was ready to abandon the project, but then we had a realization: the meniscus contains both types of collagen. This serendipitous connection led me to dive deep into meniscus tissue from a tissue engineering perspective. Coincidentally, at that time, my father was traveling the world discussing his unique experience of viable meniscus allograft transplantation, which he started doing back in 1989. This convergence of circumstances sparked an explosion of ideas and new techniques for creating and transplanting meniscus tissue and most importantly understanding why the meniscus tissue becomes damaged. Throughout this period, I was juggling my PhD research with my clinical duties as an orthopedic surgeon. We were working 100-hour weeks, managing family life alongside. It's a level of sacrifice that I think many young professionals today might overlook, but it's crucial for success in this field. However, it's equally important that the work is enjoyable, which it certainly was for me.

## Can you elaborate on your mentors and fellowship experiences?

After completing my residency and Ph.D., I was fortunate to have several influential mentors during my fellowships. One significant experience was with Johan Bellemans at the University of Leuven. At the time, he was Belgium's leading knee surgeon in both sports medicine and arthroplasty. We developed an excellent rapport, understanding each other very well. Johan is intensely performance-oriented, constantly pushing himself and those around him to be the best. His mantra was all about performance and excellence. While demanding, it was an incredibly

valuable experience. Following that, I also had the opportunity to study in Lyon, which further shaped my career.

### Can you tell us about your year in Lyon?

It was 2005, almost 20 years ago now, which is hard to believe. Lyon was truly a revelation for me. Everything I encountered there was different from what I had been taught. While we were doing hamstring ACLs, they were using the Kenneth-Jones' patellar tendon technique. We were discussing femoral rotation - three degrees, five degrees, balancing approach - while P. Neyret was advocating for zero degrees external rotation. This led me to become an expert in ligament releases; we even published a paper on the topic. We were performing opening wedge tibial osteotomies, while they were doing closing wedge osteotomies. I was also introduced to MPFL surgery there, which I later brought back to Belgium as the first surgeon to perform it in the country.

Initially, it felt like entering a different world, an alternative reality. P. Neyret, with his strong character, constantly challenged us and inundated us with data. It was a sink-or-swim situation, and I'm glad I managed to stay afloat. The experience was intense - I was there 24/7, with very little sleep and a lot of work. It was the same year I defended my Ph.D., and my family was growing - my first son was born in 2004, and my second in 2006. It was an incredibly dense period of my life.

### How would you describe Philippe Neyret as a leader 20 years ago?

Philippe, like many top surgeons, was driven by the desire to be the best. He had an authoritative leadership style - it was his way or no way - and he was also very educational. One thing I greatly appreciated about the French school, which I still do, is their respect for history. Every instrument, every procedure has a specific name, honoring the individual who first developed it. This shows immense respect for the surgical profession, something I feel we're losing in today's society.

People tend to forget that we're changing lives, often dramatically, through our interventions. It's becoming normalized, and I see a gradual loss of respect for the surgical profession, especially among younger generations. They sometimes forget the weight of responsibility we carry, particularly when things go wrong.

### What happened when you returned from Lyon?

After returning from Lyon, I attended a Belgian society meeting in South Africa in 2006. Despite being relatively inexperienced compared to the academic heavyweights present, I found myself discussing cases, including patellar instability. Remember, MPFL wasn't being done in Belgium at that time. At the meeting, I mentioned seeing MPFL surgery in Lyon, introduced by an American surgeon collaborating with Philippe Neyret. This comment caught the attention of Spike Erasmus, who had spent a decade promoting MPFL surgery against significant resistance. He was both amused and frustrated that I could so casually mention a technique he had fought so hard to introduce.

This experience taught me a valuable lesson about the time, effort, and energy required to bring about change in our field. Once a technique becomes mainstream, it's easy to forget the struggles of those who pioneered it.

## How was your professional life when you returned to Belgium in 2006?

From 2006 to 2013, I was full-time at the university. The greatest advantage was that I could focus on what I loved - knee surgery. That's one of the best aspects of academia. However, there were also challenges. In Belgium, the financial rewards in academia are limited for those who outperform the system, and the work environment can be restrictive due to strict hour counting.

I reached a point where I felt that performance was more important than mere presence. This led me to leave academia, but there were limited options for advancement. I didn't want to simply move to a private clinic next door; I wanted to progress in my career. Antwerp seemed like the only place where I could move forward.

This experience highlighted for me the importance of mobility in our profession. I often advise young surgeons to be careful not to get too comfortable in a system. It's crucial to remain mentally and emotionally mobile. Unfortunately, the European system can make this challenging. Unlike in the US, where moving between institutions often comes with career advancement, in Europe, it's much harder to move due to differences in systems between countries. I still believe this is an area we need to improve in our field. Mobility and competition are essential for growth and innovation in medicine.

## It's been a little over 10 years in Antwerp now. How is your professional life organized? What does a typical week look like for Peter Verdonk?

A typical week for me is quite hectic, balancing research, clinical work, and family life. My clinical week begins on Sunday evening when I drive to Antwerp to avoid the notoriously bad traffic – I jest that it's the worst after New York.

We start surgeries at 8:00 am in two rooms with two teams, performing up to 15 major procedures daily. Evening clinics run until 11:30 pm. This pattern continues throughout the week, with two evening clinics and occasional Saturday morning sessions. We conduct about 100 to 120 surgeries per month, totaling 1,250 last year.

Research-wise, I'm involved in numerous collaborations, publishing 10 to 15 papers annually and supervising some PhD work. Currently, my primary interest lies in diagnostics and prediction models. We've developed a European-funded program that can predict meniscectomy outcomes based on MRI and a few demographic parameters with 80% accuracy. This approach to improving surgical outcomes – or avoiding unnecessary surgeries – fascinates me.

Clinically, I focus on total knee reconstruction, ACL reconstruction, and meniscus reconstruction. The orthopedic field has matured significantly; we've mastered techniques like total knee and ACL surgeries. Now, I'm exploring cutting-edge concepts such as PEEK implants and meniscus prosthetic devices. However, it's crucial to remember that new doesn't always mean better.

## Let's discuss meniscus specifically, given your world-renowned expertise. What are your views on allografts, synthetic meniscus, and suturing? Are you still preserving menisci? Has your approach evolved?

I believe I can now almost predict why certain individuals develop medial meniscus lesions at specific stages of life – whether at 40, 50, or 60. It's fundamentally bio-mechanical. Overload, often associated with varus leg alignment, is a known factor. However, I encountered patients with neutral alignment who still developed degenerative meniscus lesions at 40, despite no excessive physical activity.

After a decade of research, we've realized that beyond mechanical alignment, knee size is crucial. Some tall individuals have disproportionately small knees or small medial femoral condyles. It's about force over surface area – either the force is significant (alignment issue) or the surface is small. This insight helps predict surgical outcomes and influences treatment decisions. For patients with early degenerative tears and neutral alignment but small medial femoral condyles, I'm cautious about meniscectomy. These patients often end up needing small unicompartmental or total knee replacements. I advocate for conservative therapy for as long as possible, and surgical meniscectomy only in specific cases. In the future we might consider immediate replacement of removed tissue, although any replacement will eventually fail.

This understanding allows me to provide better explanations to patients. I emphasize weight reduction as the most crucial factor for long-term knee health, regardless of the intervention – be it meniscus allograft, substitution, synthetic replacement, or even joint replacement. We've designed a AI platform around this concept and are currently validating it. Initial big data studies support our findings. I hope that in the coming years, we'll externally validate this data, confirming the significance of knee morphotype in predicting degenerative meniscus issues and guiding treatment decisions.

**Are you still performing many osteotomies to correct alignment? We're seeing a trend towards more unicompartmental knee replacements, even in Europe. Do you still strongly advocate for correcting the anatomy first?**

I still perform a high number osteotomies for early symptomatic OA if there's a bony varus or valgus, even if it's just two or three degrees. In Antwerp, we have our own 3D lab which allows us to analyse the lower limb alignment in all 3 dimensions. This technology helps us to design guides and execute personalised corrective surgery. The clinical challenge remains when there's no bony varus, but patients still have early medial osteoarthritis due to abnormal knee morphology. If a normally aligned knee overloads and wears out early at the age of 50, there's no perfect solution for these patients, and it's crucial they understand this. The industry will undoubtedly push us towards unis as they're easier, but they might fail earlier.

The key issue in orthopedics is that we often don't differentiate between patient subgroups when evaluating procedure outcomes. We need to get smarter about identifying clusters. The current discourse is still very generalized – CR versus PS versus medial pivot, mobile bearing vs fixed bearing unis, unis versus osteotomies – without considering the core problem in individual patients. Reality is more complex, and we should strive for a more nuanced approach, although the industry tends to prefer simpler answers like one solution for all patients.

**You're right that we focus heavily on technique and implants, but decision-making and identifying subgroups are crucial. With big data, we might gain more insights. The industry, however, seems more interested in metal and plastic. What are your thoughts on this?**

We tend to be solution thinkers rather than problem thinkers. I am saying that we should educate our children to think to the problem, not the solution. If we are teaching a total knee replacement, you'll use it for everyone. We need to understand the core problem to become smarter and more advanced.

In orthopedics, we've traditionally trained everyone on 'how to' perform procedures, and less on 'when to' perform them. We're still having the same discussions about unis versus osteotomies

that we had 30 years ago, which indicates we haven't progressed in understanding which solutions best match which patients. Some surgeons always do unis, others always do totals or osteotomies. That's the level we're at in the public domain of orthopedics, and there's still much to be done.

### **Let's move away from meniscus and discuss ACL, which is the topic of the Congress in Lyon. How do you view ACL surgery today? What's your current management approach for ACL in your practice?**

When discussing ACL, it gets emotional, and it involves my personal journey and understanding over the past 20 years. I was trained in Belgium, where we primarily used doubled hamstring grafts. BTB grafts were considered old-fashioned in the early 2000's.

My perspective changed after visiting Lyon and working with Philippe Neyret. Back then in 2005, he was performing a high number of ACLs using a BTB graft in conjunction with a Lemaire Lateral Extraarticular Tenodesis (LET). In that era, the hot topic on the main stage was 'anatomical' procedures, and the LET was considered to be non-anatomical and thus not recognized by the orthopaedic peers as being a 'good' procedure. However, during many total knee surgeries in 2005 and later on, Neyret noticed an anatomical anterolateral structure under tension when the tibia was translated forwards during TKA surgery. Later, in 2011, he published a first paper describing this anterolateral ligament, though the femoral origin was slightly misplaced in the paper. The fun fact is that upon my return to Ghent in 2006, one of my residents back then, Steven Claes, began to conceptualise his PhD on ACL and I discussed with him all my learnings from Lyon including the LET...Later in 2013, Steven published the very hot paper on the anterolateral ligament, and truly established the clinical relevance of the LET and ALL procedure.

This period was marked by conflicts between different schools of thought and even implant companies. However, I believe I played a role in reintroducing a lateral procedure that I learned in Lyon, bringing attention to its effectiveness. Ultimately, when the dust settled, it became clear that this procedure makes a lot of sense. It's a full-circle moment for me, reconnecting with the original ideas of surgeons like Marc Martens from Antwerp who had similar insights years ago. This journey shows that in orthopedics, sometimes old ideas resurface and prove their value when examined with new perspectives and technologies.

### **How do you consider the lateral part of the knee when performing ACL surgery today? Do you address it routinely or for specific cases?**

Our approach has evolved significantly over time. In 2013, Steven Claes published his study on the anterolateral ligament. In those years, we were addressing the lateral part in about 30% of cases. By 2016, we were part of Alan Getgood's Stability 1 study. Currently, I address the lateral aspect in almost 100% of my patients. However, there's an important caveat: we're now questioning whether we're overdoing it in some patients. From my personal perspective, I don't frequently see lateral osteoarthritis as a long-term consequence, so I don't believe that's a major issue ten years down the line. However, I do observe some downsides to the procedure, particularly when using a staple with a subvastus approach. I believe this subvastus approach has benefits for the athletes with very strong quads because it temporarily weakens the quad (as this muscle is a significant driver for ACL injuries in some), while the same procedure might weaken the quad too much in those with less developed quads. In the latter patient, extension loss, arthrofibrosis and adhesions might develop early after surgery.

I believe that if we perform the procedure more on the epicondylar area without the need for a subvastus approach, it has fewer effects on the quadriceps but there is the downside of potential tunnel collision between the ALL tunnel and the ACL tunnel. However, this is where it gets complicated. For a quad-dominant athlete, weakening the quad can be a significant part of the procedure's success. But sometimes we overdo it, and it becomes problematic. So, it's an excellent procedure for soccer players, but it might not be ideal for a ballerina, for instance, where I would advise an anterolateral procedure without the subvastus approach.

### **That brings us back to the concept of identifying the right procedure for the right patient cluster.**

Exactly. It's no longer about whether your surgical technique is superior for every patient. We're now discussing which specific surgery is better for which specific patient. We're reconstructing the ACL and addressing the lateral aspect, but the type of procedure might affect the outcome, elevating it from very good to excellent. We're no longer talking about returning patients to "good" function; our goal now is to achieve "excellence".

This principle applies to every field of knee surgery, and indeed, to orthopedics as a whole. We've become so proficient that we're differentiating between good and excellent outcomes. Of course, there are many egos in orthopedics, with surgeons claiming to be the best.

Many of us compare ourselves to chef cooks, but there's a crucial difference. A three-star restaurant chef selects the best raw products available and then prepares a great dish. In contrast, we don't always have the luxury of operating on the best raw products i.e. the elite athletes. Sometimes we have to work with an average patient who smokes. Making the best outcome for that patient is what makes us great surgeons, even if the outcome might not be absolutely 'great'. We're not just cherry-picking the easiest cases or working exclusively with athletes.

Our challenge is to create the best possible outcome for each individual patient who walks into our office. That's different from a three-star chef who controls their ingredients, we can not control the quality of the patient all the time. Young surgeons need to understand this. It's impossible to be greatest all the time, but you can do your best for each individual patient. With ACL injuries, for instance, we now understand that a 27-year-old professional athlete rupturing their ACL is just bad luck, and most will return to sport. However, a 16 or 17-year-old athlete presents a real challenge, since many have intrinsic design flaws in their knees and/or muscles. Even the best surgeon will have a higher failure rate with these younger patients.

The pool of elite athletes is small, so you can't build a practice solely on that group. It's about finding the right balance between challenging cases and achieving consistent, excellent outcomes across a diverse patient population.

### **Peter, could you tell us about the national and international scientific societies you've been involved with and found interesting?**

Certainly. I've been heavily involved with the Belgian Knee Society, serving as its president two years ago and continuing to be part of the board. Currently, I'm the president of the Belgian Orthopedic and Traumatology Society. Our current challenges are more about organizing and defending our profession, ensuring the best treatment for our patients, and getting them back to activity while struggling with budget restrictions because politicians like to spend money on the inactive people too.

My involvement needs to be more on the political side than the scientific one, as the science in our field is quite mature. The discussions now aren't about the technicalities of total knee replacements, but rather about costs for society. We need to compare our impact on society with other areas of medicine, which is becoming increasingly complex for an orthopedic surgeon who tends to focus solely on the technical procedure.

Internationally, I've been involved with ESSKA, ISAKOS, and ICRS, among others. My participation in these societies has varied over time, sometimes being more involved, other times less so.

**You mentioned technology. What's your insight on the current trend of robotics in surgery, particularly for ACL procedures? We hear a lot about it for total joint replacements, but what about sports medicine?**

I have a strong opinion on this. While I'm often jokingly called the "robot" in my department, I'm skeptical about the current value proposition of surgical robots. Yes, they offer higher precision, which we already achieve with navigation systems. However, this increased precision hasn't yet translated into better clinical outcomes in other words, increased precision does not equate with superior clinical outcome. We might see some reduction in revision rates in the future, but that's still uncertain.

My main issue with robots is their limited application. In a knee practice like mine, where I perform 300-350 total knee arthroplasty procedures yearly of the total 1250, a robot would be unused for a significant portion of the time. It's not utilized for osteotomies or ligament surgeries. I believe in the potential of robotics, but it needs to be applicable across various procedures to justify the cost.

Currently, these robots are not open platforms, which makes sense from a business perspective but less so clinically. It's challenging to justify investing in a robot that's only used for one or two procedures like total and unicompartmental knee replacements. That said, I do believe in technology, particularly personalized technology. I think there's often a mismatch between implant shapes and native anatomy, especially in younger patients with early-onset osteoarthritis. This is where personalized technology could really make a difference.

In Belgium, we've observed that the average age for revision surgery is younger than the average age for primary implants. This suggests we have issues with certain patient populations or morphotypes, possibly due to implant fit. Instead of avoiding these challenging cases, I believe technology will help us move forward, either through individualized implants or better implantation techniques. So while I'm positive about technology in general, I think we need improved versions of the current robotic systems and more open platforms to truly revolutionize our field.

**It seems the technology just needs to be improved, both in how we use it and what's available.**

Exactly. We're dealing with version one of this technology. We need versions two, three, four, and five. An open platform would be a significant step forward, but if you ask industry representatives, they'll say there's no business model for because of the restricted budgets.

**What advice would you give to young colleagues who want to follow in your footsteps?**

To young colleagues, I'd say "work hard, play hard" should be the primary motto. Nothing comes for free or easily, but you should also enjoy the hard work. Build relationships and get to know

people. Don't isolate yourself; reach out and try to find like-minded individuals. You'll always be surprised by how many like-minded people are out there, even among those on the podium. I try to be approachable and open to younger colleagues, challenging them to become their best selves. So again, "work hard, play hard" would be my advice.