MENTORS IN ORTHOPEDICS

JOAN LEAL

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SUMMARY

Joan Leal's trajectory reflects a deliberate effort to integrate Spanish orthopedics into the broader European landscape. From his formative residency in Madrid to specialized training in Lyon, Leal has focused his clinical practice on the precision of robotic-assisted knee arthroplasty. As a former president of the Spanish society, he emphasizes a triad of clinical excellence, research, and the mentorship of residents. His vision anticipates an era of individualized alignment and artificial intelligence, ensuring the specialty's technical and academic evolution.

On the occasion of a Congress in Barcelona, we had the opportunity to meet Joan Leal, a passionate surgeon, nurtured and educated in the vibrant city of Barcelona. Throughout his career, he has worked passionately to promote orthopaedic surgery in his country, aiming to give it a major place on the world orthopaedic stage.

If you agree, I'd like to start at the beginning - could you tell me a bit about your background? Where were you born and raised? Are you from the Barcelona area or from other parts of Spain?

> Certainly, I'd be happy to share my personal history. I was born and raised in the heart of Barcelona. My family, too, is from Barcelona. I completed my primary education in a village near Barcelona called Sant Cugat. Following that, I attended university and carried out my studies in Barcelona, notably at the Hospital Clinic, one of the most emblematic hospitals in the city. After finishing my university studies, I sat for the Medical Intern Resident, or MIR, exam in order to choose my specialization. I secured my residency at the Institut Universitari Dexeus in Barcelona.

> To sum up, my entire education, from start to finish, took place in Barcelona. I then started my career at the Hospital del Mar, and later, I pursued new projects as the chief of service in Igualada and, most recently, Manresa. I hope that gives you the information you were looking for.

Yes, absolutely. The aim is to understand how you ended up with your practice today, and what your journey was like. Were you from a medical family or are you the only doctor in your family? And why did you choose medicine, and specifically, orthopedic surgery?

> My medical school was highly competitive at that time and held a strong position in the national exam, which is a requirement in Spain to gain access to and select residency programs. This advantage facilitated my acceptance into the most competitive orthopaedic and traumatology residency program in Spain at Hospital La Paz in Madrid. I devoted five intensive years to study and hard work there, during which I concurrently pursued a PhD program in Anatomy.

What drew you to the field of orthopaedic surgery?

> I am the only doctor in my immediate family. My father was an engineer and my mother was a teacher. In my mother's family, there were many doctors in the past, but in my immediate family, I am the only one practicing medicine.

And why did you choose orthopedic surgery?

> That's a great question. I wasn't certain at first that I wanted to become an orthopedic surgeon. I believe my choice was influenced by my experience working on-call with orthopedics at a hospital near Barcelona, in the years before I chose my specialty. While I was certain I wanted to be a surgeon, I was initially unsure whether to specialize in orthopedics, cardiac surgery, or plastic surgery. But ultimately, because of my on-call experiences, I decided on orthopedic surgery. It was a decision that wasn't firmly set from the beginning.

During your training, did you meet any mentors or senior surgeons who influenced you towards orthopedic surgery? Perhaps you admired their work and wanted to emulate them?

> Indeed, a family friend, who was the chief of service in Terrassa, a village near Barcelona, was a significant influence. He always encouraged me to become an orthopedic surgeon. He could be considered a mentor to me. However, I wouldn't say I had a strong influence from other orthopedic surgeons.

Have you spent much time outside Spain? Your English is very good, and you seem to know many people outside of your home country. How did that come about? It's quite uncommon.

> When I was 18, my parents sent me to the United States for six months. I stayed in California, near San Francisco, in a small village called Turlock. I lived with a host family, the father of which was a doctor and a chiropractor. This year-long experience was eye-opening, and it was interesting to observe how medicine is practiced in the United States. That exposure was perhaps a pivotal moment in solidifying my decision to become an orthopedic surgeon.

So that's where you acquired your language skills. But where did your interest in international networking and thinking outside the box originate from?

> Could you clarify what you mean by "international"?

I mean, we see you frequently traveling around Europe. How did you develop such an active interest in the international field?

> When I started as a surgeon, I felt the Spanish, particularly the orthopedic, culture was relatively underrepresented. Only a few Spanish surgeons were well-known in the European specialty. I

> believed we had to change that and show the world, and Europe, that Spanish and Catalan orthopedic surgeons could match up to their European counterparts. This belief was perhaps influenced by the French and Italians who were already well-established. I wanted people to know that we were here and trying to spread the word throughout Spain.

Absolutely. The Spanish orthopedic culture was initially less expanded outside of the country, but that has changed. Thanks to you and others, Spain has become a strong presence in Europe.

> Yes, we've made significant progress. The situation has changed since the 1980s and 1990s when it was challenging to make a name for oneself in Europe. But now, we are connecting with the rest of the world, which is quite exciting. We recognized the need to be present internationally a few years ago.

How do you view the current status of national societies in Spain? They seem to be getting stronger and better organized. Specialty societies like the arthroscopic Spanish society appear to be flourishing. Is it important for you that these societies have a solid structure before they can expand beyond the country's borders?

> That's a pertinent question. As a young professional, I sought to be involved with the Spanish society. Presently, Spain has two major societies - the arthroscopic Spanish Association society and the Spanish knee society. The other factions are rather regional and not as influential. I'm proud to have served as the president of the Spanish society last two years. In the past ten years, the society has grown significantly, transforming from a small community into a reference point in Spain for all scientific members in orthopedic and arthroscopic surgery. Both societies are actively seeking to collaborate with European and global societies. We are deeply connected with ESSKA and other societies in Portugal, Italy, and Morocco. Our goal is to extend our influence and knowledge beyond our national borders. I feel privileged to have contributed to this evolution.

It's clear you played a crucial role. How does the Spanish society organize itself? Do you have an annual meeting?

> Yes, we typically hold our meeting in May or June. Our primary focus is education, particularly for our residents. We're invested in accreditation, understanding that the residents are the future of our specialty. We aim to impart all our knowledge to them and are working towards accreditation in various fields like trauma, preservation, arthroplasty, and arthroscopy. Over the past two years, we've promoted a research-oriented approach among our members, establishing a master's program in research. We believe our profession stands on three pillars: patient care, education, and research. Patient care is necessary because we need to operate and consult with patients. Education ensures excellence in patient care, and research helps us understand if we're doing things right. These are the three pillars we strive to uphold and instill in our surgeons.

That's very interesting. I've noticed a declining interest in research among the younger generation in my country. But the way you frame it is compelling. You're not pushing for research just for the sake of publishing.

> Exactly, we conduct research to confirm that our practices are effective and beneficial.

That's an excellent way to advocate for research. I wholly support that. Now, could you tell us about your current practice? How is it organized? Do you focus more on sports or arthroplasty? Where do you work, and what's your work environment like? Could you describe a typical week for you?

> My regular week is quite hectic. Although I'm an orthopedic surgeon and head of the department, I carry a lot of administrative duties. I still maintain a balance by dedicating three days to consultations and three days to orthopedic surgeries. I work in both private and public institutions, where I lead the service in the public institution, which is a renowned hospital in the central part of Catalonia. On Mondays and Wednesdays, I'm in the operating room in the morning and hold consultations in the private service in the afternoon. On Tuesdays, I hold morning consultations and operate in the afternoon. On Thursday and Friday mornings, I handle administrative tasks. My research and education activities are limited, mostly confined to the weekends, nights, and Thursday afternoons, which I'm not particularly proud of. I recognize that I need to optimize my research activities and learn from others in this regard. While it's crucial for me to be involved in surgeries and consultations, I also need to find time for research and education.

Your schedule is indeed clear. What kind of surgeries do you typically perform?

> I predominantly perform knee replacement surgeries, including partial and total interventions. My philosophy, and what I've communicated to my department, is that we should focus on a single task or activity to achieve excellence in our treatment. This approach may be controversial, as many of my colleagues are multi-faceted in their practices. However, I believe that specializing in one thing, in my case, knee replacements – partial, total, and revisions – allows me to deliver exceptional treatment.

I couldn't agree more. Specialization is key in an ever-evolving field. Being a jack-of-all-trades can make it difficult to excel in any particular area. On the topic of partial knee replacements, what would you say is an ideal percentage of cases to perform?

> Currently, about 10 percent of my surgeries are partial knee replacements. I'm quite particular about the cases in which I opt for a partial replacement, I only do so when I'm fully confident it's the right approach. However, I anticipate that this number might increase in the near future.

I know you're very interested in robotics. Is your inclination towards doing more partial knee replacements related to your use of robotics?

> You're correct, but the issue is that the software currently available at my hospital only supports total knee replacements. This is because the software for partial replacements is quite expensive, around two hundred thousand euros. When considering this with my hospital directors, they question whether it's worth the cost given the limited number of partial replacements I currently perform. I'm certain that having the software for partial knee replacements would increase their proportion among my surgeries, but currently, I don't have access to robotic assistance for these procedures, which is perhaps why they make up only 10 percent.

Can you share why you believe robotics to be beneficial for knee surgeries in general?

> The introduction of robotics in knee surgery signifies an evolutionary step from manual surgeries and later, navigational techniques. Robotics is a tool that is advancing us towards the "magic box" era, where a device will enable us to incorporate various techniques and technologies like 3D

> printing, nanoparticle use, and even more precise and less invasive surgeries. It's a means to enhance patient satisfaction, although it's important to note that while I am an early adopter of robotics, I do not believe that it alone will revolutionize patient satisfaction. Multiple factors like meeting patient expectations can have a greater impact on their satisfaction. Robotics does offer benefits such as increased precision, less invasiveness, and enhanced safety, and it allows us to better understand and improve our methods. One significant change I've observed in my practice since the adoption of robotics is that it visually confirms whether my surgical actions are correct or not.

Why do you think robotics is superior to the navigation techniques we had a decade ago?

> That's a good question. I wouldn't say it's superior, rather it's an evolution. Navigation relied on conventional cutting guides, similar to what we use today. But with robotic systems, like Mako, we have both navigation and the additional precision offered by a robotic arm. This is a different and advanced step from navigation. It doesn't end here; we'll continue to refine and evolve the way we operate.

Do you think the future of knee surgery will involve artificial intelligence aiding us in making better decisions, or do you anticipate improvements in robotic technology? What does the evolution look like to you?

> I foresee that the next stage of evolution involves robotic devices suggesting what actions we should take. This will be possible because of the vast amount of data that robotics allows us to collect. Of course, we need to ensure we're gathering good data as that will lead to useful suggestions. With the vast database of patient data – their age, race, functional scores, etc. – the device will be able to recommend optimal alignment and positioning of implants. We will need to trust these recommendations, as they'll be based on a large database of results. So, artificial intelligence is indeed the future, and probably the near future at that. And let's not forget about 3D printing, which I believe will be incredibly significant. Based on our data and understanding, we'll decide the best course of action regarding anterior, posterior, distal alignment, stability, etc. Then, we'll be able to print our implants during the same surgical procedure. This combination of robotics and AI-based suggestions with 3D printing will help us provide the best outcomes for our patients. Ultimately, the final stage might involve 3D printing with biomaterials. This is what I refer to as the "magic box".

You've touched on the topic of alignments and I'd like to explore that a bit more. From the historical mechanical approach to the personalized way you handle it today, can you tell us more about your philosophy?

> My philosophy is centered around individualized alignment. That is to say, it's not strictly mechanical or kinematical or adjusted or restricted. It's all about understanding that every patient requires a unique alignment, a unique stability, a unique constraint. We must seek to understand the needs of each patient, and it's impossible to quantify a single alignment solution that will work for everyone. The idea of one-size-fits-all alignment – whether that's kinematic, mechanical, restricted, adjusted, anatomical – is, in my view, incorrect. Each patient requires a different alignment.

That's very interesting. Now, when it comes to the constraints, do you also consider personalizing those according to each patient's needs? How do you go about doing that?

> It's not a simple task. In many cases, with standard implants, our options are somewhat limited. For instance, if we have a small femur, and a not-so-great PCL, we'd need to go with an ultracongruent implant because fitting a big box into a small femur just isn't feasible. So, the options aren't exactly plentiful at present. However, I do believe that the best approach is to use a CR system that allows us to preserve our natural ligaments, which are crucial. But the CR, or cruciate-retaining, system presents its own challenges. It's tough to maintain the same tension with your cuts and if that's not achieved, it could result in pain or restricted range of motion. In my training in Lyon, I was taught to always use a PS system and that's what I did for a long time. However, now with robotics, I'm starting to explore the possibility that if I can ensure the cut is the same as what I will put on, then the CR system may be the way to go. In this case, I'd probably only use one interface, namely an uncemented knee.

> The goal for me is to emulate the structure of the original knee as closely as possible with biomaterials, minimal constraints, and aligned accordingly. But we also need to acknowledge that a natural knee and a prosthetic knee are inherently different, which is the real challenge we face. We try to replicate the native knee, but we're not operating in the same circumstances. We're working with prosthetic implants, different interfaces, different elasticity, and different biomechanics. It's a complex issue, and I may not have all the answers, but I strive to do the best for each patient with the knowledge and understanding I have.

I think your approach is quite clear. As you said, it's important to remember that it's not a natural knee we're dealing with. There are no menisci, no cartilage – it's different. We need to keep that in mind. You also mentioned ESSKA earlier – could you tell us more about your involvement with ESSKA?

> My journey with ESSKA is fairly typical. I recognized the need to have a presence in Europe and considered joining a part of ESSKA, particularly the European Knee Associates (EKA), given that it is most relevant to my line of work as a knee replacement surgeon, and not a sports medicine surgeon. I have a strong professional relationship with Michael Hirschmann, who is one of the leading figures in our field both in Europe and globally. After spending some time with him and his wife, he proposed the idea of me joining the EKA board, to which I readily agreed. Before that, my mentor in Spain, Joan Carlos Monllau, had made significant contributions to ESSKA and EKA through numerous presentations and active participation. Monllau has been my guiding light from the beginning and is now set to become the president of ESSKA. I eventually realized that my place in ESSKA would be within EKA, where I felt I could make meaningful contributions and help build something of value. So, that's my story with ESSKA. It's not particularly extraordinary but significant to me.

> With Monllau now set to assume the presidency of ESSKA, it's an exciting time, much like when we had a French president and France was more involved.

And do you think his presidency will benefit the Spanish orthopedic society?

> Yes, absolutely. At present, I believe Italy, France, and Spain hold strong positions within the European orthopedic landscape. France, particularly Lyon, has a long-standing tradition of research. Spain and Italy have recognized the need for active involvement in studies, research,

> and fostering strong ties with key individuals in Europe. The Spanish society, especially the arthroscopical one, is eager to establish connections with ESSKA mentors and members.

You mentioned Lyon. Do you have any special connections with that city?

> Indeed, during the fifth year of my residency, Pep Tuneu, who spent three to four years of his education in Lyon, recommended that I go there. He believed that the best place to learn about knee pathology was Lyon. Following his advice, I visited Lyon in 2005 for a six-month stint.This experience turned out to be incredibly transformative for me. The rigorousness, professionalism, and organization of the people in Lyon had a profound impact on me. I was particularly struck by their depth of knowledge. Upon returning to Spain, I was determined to emulate their approach.

> During my time there, I attended the Journées Lyonnaises, which was held biennially at that time. I was deeply impressed by the way the meeting was organized, how they curated each presentation, selected the best way to present each slide, and the range of topics discussed.

> The experience in Lyon significantly influenced my career path and deepened my interest and passion for the knee. I had the opportunity to interact with several prominent figures, including Pierre Chambat and Gilles Walch. Although my focus shifted towards knee replacement later, the experience in Lyon holds a special place in my heart.

What are the other things you enjoy in life outside of knee surgery?

> Primarily, the answer is family. I adore my family and I want to spend my time with them. That's the most important thing for me. I have an amazing wife and two daughters, aged 28 and 20. They're wonderful. One is an economist and the other is a biologist. Different paths indeed. In my everyday life, I like to go walking, mountaineering. I do a lot of climbing, fishing, sports in general is something I'd love to do more of, but I can't. It's incredible, but I simply don't have the time for sports, like tennis. Tennis is perhaps one of my most loved sports. I used to play it quite a bit when I was younger, from the age of five. But right now, it's hard for me to find time to play sports because I'm usually busy. On the weekends, I have time for my family and I want to be with them. Of course, I enjoy reading, listening to music, but overall, walking and hiking are some of my most cherished activities. And, of course, cooking. When I cook, I forget everything. It's quite incredible. The moment I start cooking, I forget everything else. That truly fascinates me. But it's not something exclusive to me. Any other activity that brings me as much satisfaction as cooking does, allows me to forget everything else. Specifically, I forget all about my travels and work

So, what's your preferred dish? What's your speciality?

> I would say paella. I'd say paella, but it's not really paella because paella is from Valencia. But I really love to cook rice, especially in a large pan. That's my specialty.

One last question, and I always pose this question to conclude my interviews. Suppose today, a young guy comes up to you. He's just starting his orthopedic training. He seeks advice from you. He says, "I want to be like you in 20 years. What should I do? What are the mistakes I should avoid, and what advice can you give me at the early stage of my career?"

> Oh, my God, that's really tough to answer. To my daughters, I've said, "Don't choose this career path." Right. Yeah, but anyway. No, for me, orthopedic surgeons, especially the residents in my hospital, are the crown jewels. I prioritize their education because I think it's the most crucial aspect. I always tell senior surgeons, "Don't exploit your residents. Let the residents gain from

> you." You know, that's the most important thing. You must impart all your knowledge to your team, to your subordinates, to your budding surgeons because they are the future. Give them all the advantages.