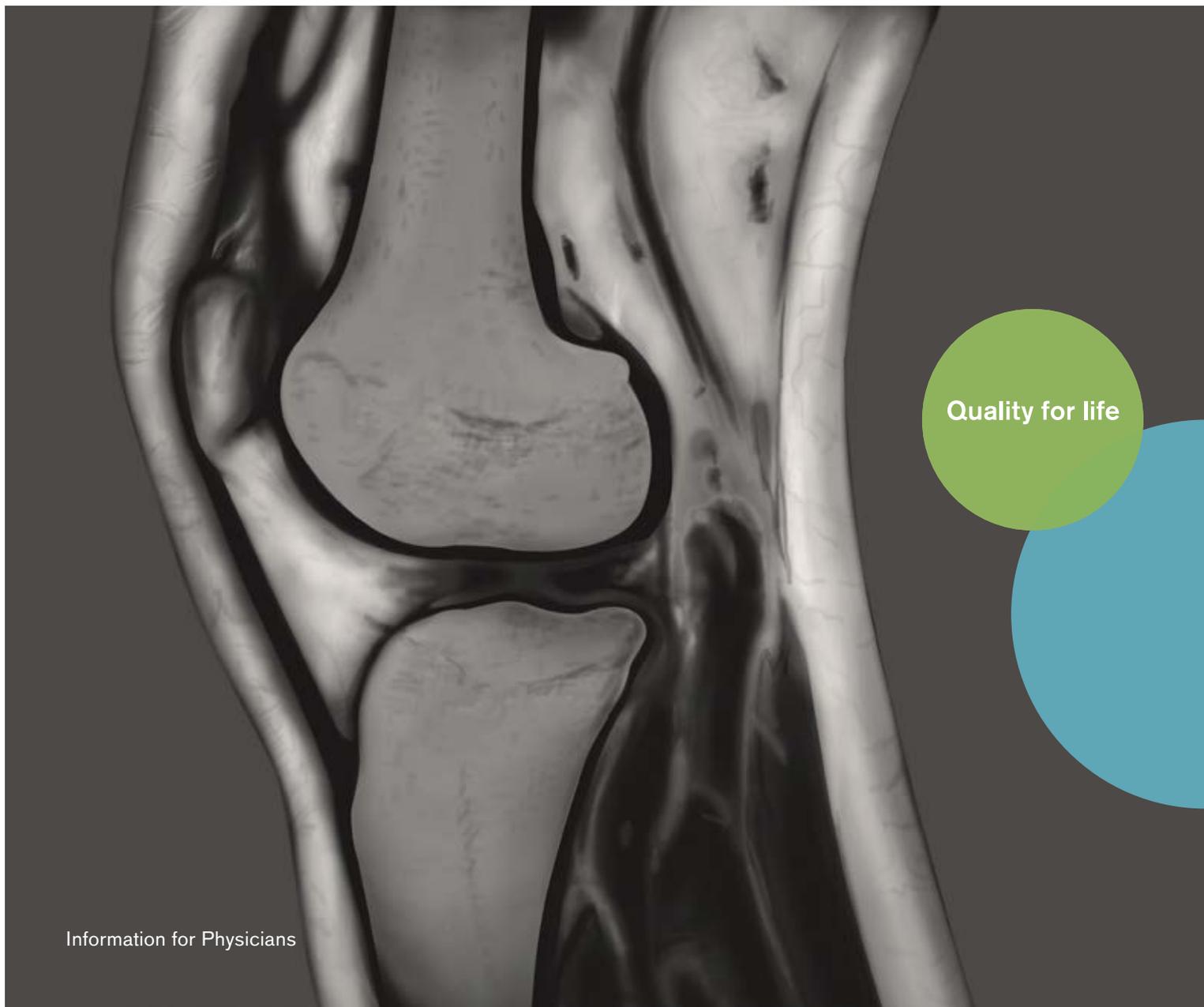


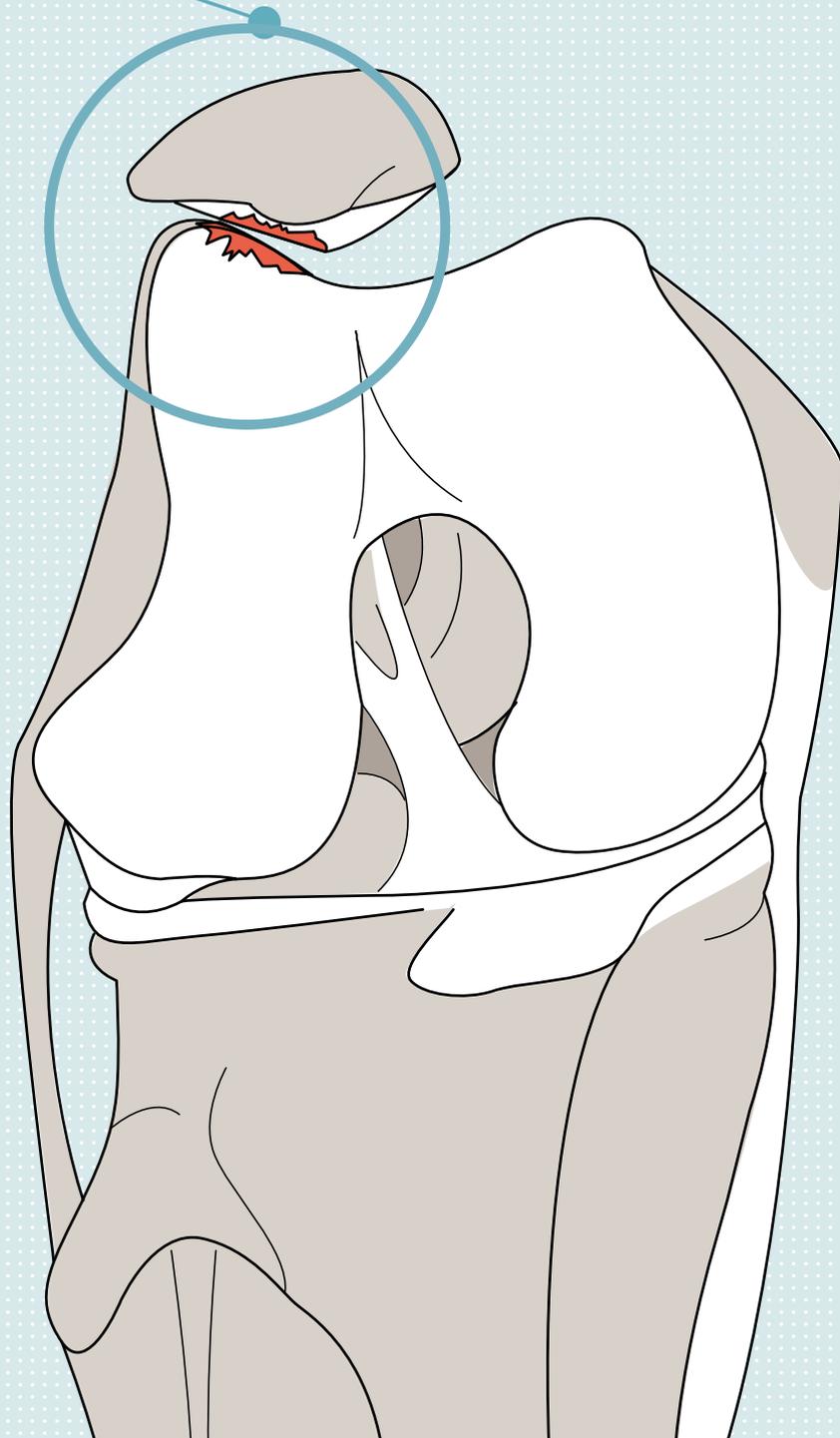
The Solution for Anterior Knee Pain

Dynamic Re-alignment with the Patella Pro



Quality for life

Patellofemoral
Pain Syndrome



Conservative Treatment of PFPS

Dynamic Patellar Tracking

The patellofemoral pain syndrome (PFPS) is one of the most frequent indications in orthopaedic practice. For example, 18 to 33 percent of all knee problems treated by specialists in orthopaedics or sports medicine are attributed to it.¹ Moreover, a study of 1,525 students at the US Naval Academy showed an incidence of 22/1,000 person-years; women were affected twice as often as men.²

Typical for PFPS is that functional malalignment, lateralisation of the patella and the resulting pain, compensatory posture or malposition are mutually dependent and reinforce each other. Conventional therapy methods have thus far rarely led to long-term treatment success and freedom from pain.

There is a high recurrence rate between 15 and 44 percent.³ Ottobock, in cooperation with the Clinical Excellence Circle (CEC) – a network of medical specialists – therefore developed a new treatment concept based on the Patella Pro orthosis.

► Patented solution

Patella Pro is the first orthosis based on the principle of dynamic re-alignment. This mechanism tracks the patella in the relevant flexion angles while simultaneously preventing overcorrection or tilting of the patella. The biomechanical effect was confirmed in in vivo and ex vivo studies (see page 6). A study of sports students also proved that in a multimodal therapy concept, Patella Pro quickly led to a reduction of the subjective intensity of pain in patients with anterior knee pain (page 8).

¹ Taunton, J.E., Ryan, M.B., Clement, D.B et al. (2002). A retrospective case-control analysis of 2,002 running injuries. *British Journal of Sports Medicine*, 36(2), p. 95-101; De Haven, K.E. & Lintner, D.M. (1986). Athletic injuries: comparison by age, sport and gender. *American Journal of Sports Medicine*, 14(3), p. 218-224; Devereaux, M.D. & Lachmann, S.M. (1984). Patello-femoral arthralgia in athletes attending a Sports Injury Clinic. *British Journal of Sports Medicine*, 18, p. 18-21; Grabiner, M.D., Koh, T.J. & Draganich, L.F. (1994). Neuromechanics of the patellofemoral joint. *Medicine and science in sports and exercise*, 26(1), p. 10-21.

² Boling, M., Padua, D., Marshall, S. et al. (2010). Gender differences in the incidence and prevalence of patellofemoral pain syndrome. *Scandinavian Journal of Medicine & Science in Sports*, 20(5), p. 725-730

³ Hawkings, RJ, Bell, Anisette G. Acute patellar dislocations. The natural history. *Am J Sports Med*. 1986; 14:11720

The Patellofemoral Pain Syndrome

Characteristics, Causes and Therapy

The term “anterior knee pain” comprises various knee pain symptoms that are frequently associated with lateralisation of the patella. Typical everyday activities that cause pain are walking, running, climbing stairs, squatting and sitting for long periods.

Functional malalignment can be caused by a valgus position of the knee joint. Muscle weakness in the hips, abnormal foot position and muscular imbalance and contractions in the thigh can contribute to the occurrence of the patellofemoral pain syndrome. It is often triggered by strain to the patellofemoral joint, for example from strenuous sports.⁴

The primarily conservative therapy should be multimodal and patient based depending on the specific cause. In addition to the orthosis for re-aligning and medialising the patella, various medication and physical therapy measures are also possible.

⁴ Petersen, W., Ellermann, A., Liebau, C. et al. (2010). Das patellofemorale Schmerzsyndrom. *Orthopädische Praxis*, 46 (8); Witvrouw, E., Lysens, R., Bellemans, J. et al. (2000). Intrinsic risk factors for the development of anterior knee pain in an athletic population: A two-year prospective study. *The American Journal of Sports Medicine*, 28(4), p. 480-489; Heintjes, E.M., Berger, M., Bierma-Zeinstra, S., Bernsen, R., Verhaar, J. & Koes, B. (2008). Pharmacotherapy for patellofemoral pain syndrome. *Cochrane Database of Systematic Reviews*, 3.; Powers, C.M. (1998). Rehabilitation of patellofemoral joint disorders: a critical review. *Journal of Orthopaedic & Sports Physical Therapy*, 28(5), p. 345-353; Collado, H. & Fredericson, M. (2010). Patellofemoral pain syndrome. *Clinics in Sports Medicine*, 29(3), p. 379-398. Seedholm, B.B., Takeda, T., Tsubuku, M. et al. (1979). Mechanical factors and patellofemoral osteoarthritis. *Annals of Rheumatic Diseases*, 38(4), p. 307-316.

New Therapy Standard

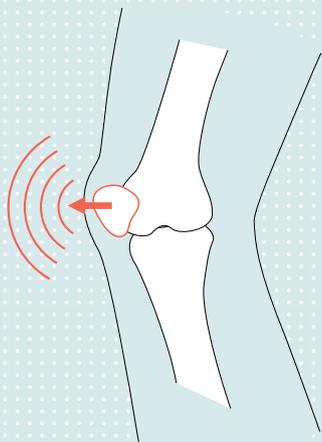
Dynamic Patellar Re-alignment

At flexion angles between 10 and 30 degrees, there is an especially great risk of malalignment between the patella and the trochlea – the patella must therefore be tracked particularly well in this range. At flexion angles over 30 degrees, the risk of malalignment is reduced due to increasingly improved tracking in the trochlea. In addition, the patella is better stabilised by the rectus femoris muscle and the patellar tendon. If correction by the orthosis is increased in this range, tilting may occur, which can also cause pain.

Ottobock therefore worked with the Clinical Excellence Circle to develop the dynamic patella re-alignment mechanism. In the Patella Pro, the medialising force increases progressively in the critical flexion angles between 10 and 30 degrees, but then increases very little at further flexion.

Flexion 10°–30°

- ▶ **High risk** of patellar maltracking (shifting outward)



- ▶ **Precise tracking** of the patella by Patella Pro

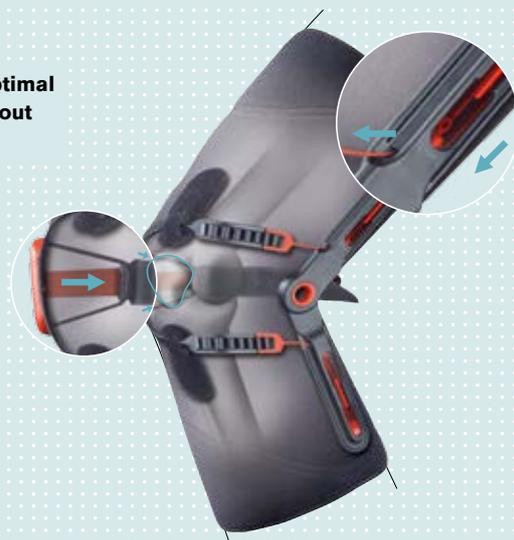


Flexion > 30°

- ▶ **Lower risk** of patellar maltracking



- ▶ **Continued optimal** tracking without



Scientifically Proven

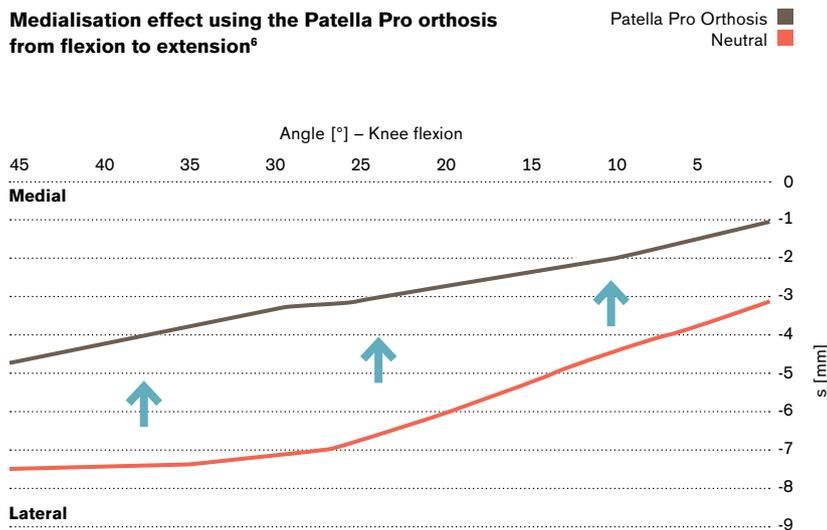
Ex vivo and in vivo study of the biomechanical effect



All studies so far have confirmed the effectiveness of Patella Pro. An ex vivo study on six cadaver legs proved the biomechanical function of patellar re-alignment⁵. It showed “medialisation of the patella during the entire extension movement of the knee.” At the relevant flexion angle from 10 to 30 degrees, medialisation increased relatively during flexion by ± 1.04 to 1.76 mm compared with the neutral condition without an orthosis.

An in vivo study on seven patients with PFPS and clinically diagnosed unstable patella also showed a clear ($p < 0.05$) improvement in medialisation of the patella compared with the control groups with no orthosis or with a different orthosis.⁶

Medialisation effect using the Patella Pro orthosis from flexion to extension⁶



^{5/6} G.P. Brüggemann et al.: Patella-Rezentrierungs-Orthese Patella Pro [Patella Pro Re-alignment Orthosis]. Biomechanical evaluation: ex vivo and in vivo; not yet published.

Medialisation effect	Patella Pro (orthosis)	Competitor A (orthosis)	Competitor B (support)
Standing	■	■	
Going into flexion	■		■
Coming out of flexion	■	■	

Innovation through Co-operation

Ottobock developed the mechanism of action of the Patella Pro with specialists of the Clinical Excellence Circle (CEC), an interdisciplinary team of renowned orthopaedics, sports medicine and biomechanics specialists as well as therapists and orthopaedic technicians. The goal of the network, established in 2006, is to develop therapeutic orthotic solutions and concepts for therapy and further training.

Developed jointly with

CEC Clinical
Excellence
Circle

Dr. R. Best
Prof. Dr. G. P. Brüggemann
Dr. A. Ellermann
Dr. A. Gösele-Koppenburg
Dr. F. Hoffmann
Dr. A. Kannenberg
PD Dr. C. Liebau
Prof. Dr. W. Petersen
PT. MT. I. V. Rembitzki
CPO H. Semsch



“Use of the Patella Pro orthosis for patients with unstable patella and PFPS showed significant ($p < 0.05$) medialisation of the patella in comparison with neutral and control conditions with a frequently prescribed orthosis.”

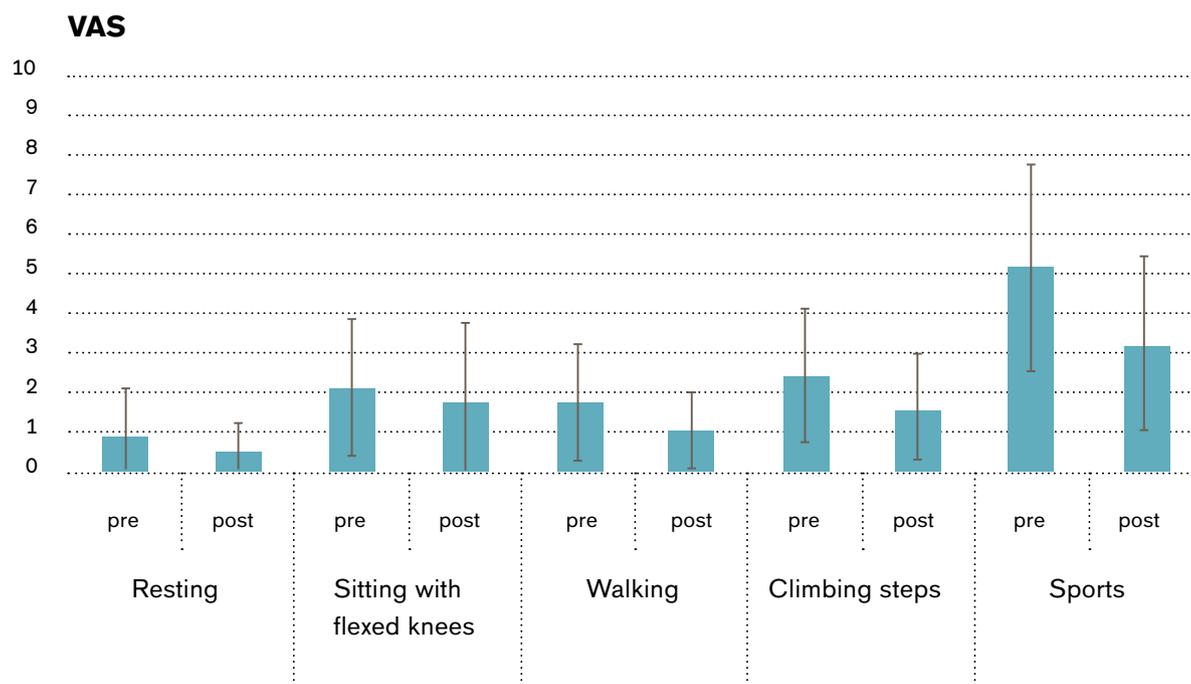
Prof. Dr. G.P. Brüggemann, Director of the Institute of Biomechanics and Orthopaedics at the German Sports University in Cologne

Multimodal Therapy Concept

Pain reduction within a short period

In a five-day study at the Institute of Biomechanics and Orthopaedics (IBO) at the German Sports University in Cologne, significant improvement of symptoms was found in the participating patients (age 24.10 ± 3.54 years; mean duration of symptoms 27 months). Especially during sports, the intervention showed a clear decrease in the subjective

intensity of pain (sports before: $5.10 (\pm 2.60)$; sports after: $3.20 (\pm 2.20) \rightarrow p = 0.034 \rightarrow p < 0.05$). In addition, an increase in walking performance was observed after therapy. But even when sitting or resting, a reduction in the intensity of pain was detected.



Methodology and Design

The basis of the multimodal therapy concept was fitting participants with the Patella Pro orthosis, which they wore six hours a day. During the study period, a specially developed training programme (“Patella Move”) with the four units pain reduction, activation, balance and coordination & strengthening was conducted once a day to support treatment.

Other components of treatment were McConnell gluteal taping⁷, chlorethyl application to the patellar and Achilles tendon⁸ and a special vibration training for increasing muscle coordination among other things.⁹

“After just a brief treatment period, I had no problem jogging again for half an hour. That allows me to hope that I will regain my former condition soon.”

Tonda, participant in the study at IBO, on his experience with Patella Pro



⁷ McConnell, J. (2002). The physical therapist's approach to patellofemoral disorders. Clinics in Sports Medicine, 21, p. 363-387.

⁸ Schöps, R. & Seeger, R. (2009). Physikalisch-medizinische Therapie bei akuten und chronischen Schmerzen. Der Schmerz, 23, p. 191-212.

⁹ Rauch, R. (2009). Vibration therapy. Developmental Medicine & Child Neurology, 51(4), p. 166-168.

At a Glance

Prescribing Patella Pro

Patella Pro is an innovative orthosis for the treatment of anterior knee pain. Using the newly developed re-alignment technology, it medialises the patella in the critical flexion angles.

This has been proven by biomechanical evaluations (ex vivo and in vivo) and practical experience of physicians, who report a substantially increased quality of life for their patients.

Indications

- Patellofemoral pain syndrome
- Patellar maltracking
- Retropatellar osteoarthritis
- Patella chondropathy/chondromalacia
- Patella dislocation and subluxation
- Patellar tendon injury
- Anterior knee pain after surgical procedures on the knee (e.g. total knee replacement, lateral release surgery)

Advantages at a Glance

- Medialisation of the patella
 - Better compliance
 - Easy to adjust individually
 - Good wearing comfort
 - Safety when moving
 - Practically invisible under clothing
 - Suitable for everyday use
-

We would be happy to send you more information, studies and articles – or demonstrate the mechanism in your practice.

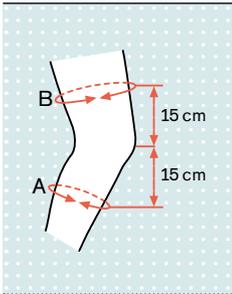
**Send an e-mail to export@ottobock.de or call
T +49 5527 848-1706 for an appointment.**

Tested

Institute for Biomechanics
and Orthopaedics/Cologne

**Biomechanical Efficacy
and Effectiveness**

CEC Clinical
Excellence
Circle



Side	Size	Circumference A		Circumference B	
		cm	inch	cm	inch
L/R	-XS	32-35	12.6-13.8	40-44	15.8-17.3
L/R	-S	35-38	13.8-15.0	44-48	17.3-18.9
L/R	-M	38-41	15.0-16.1	48-52	18.9-20.5
L/R	-L	41-44	16.1-17.3	52-56	20.5-22.0
L/R	-XL	44-48	17.3-18.9	56-61	22.0-24.0
L/R	-XXL	48-52	18.9-20.5	61-65	24.0-25.6



Otto Bock HealthCare GmbH
Max-Näder-Straße 15 · 37115 Duderstadt/Germany
T +49 5527 848-1706 · F +49 5527 72330
export@ottobock.de · www.ottobock.com