



LINK Endo-Model Knee System

Presented by:



Waldemar Link GmbH & Co. KG

Barkhausenweg 10 · 22339 Hamburg, Germany

Tel.: +49 40 53995-0 · info@linkhh.de

www.linkorthopaedics.com

LINK Endo-Model Knee System

Literature Research

- 02 **Purpose of the Research**
- 03 **ODEP Rating**
- 04 **Definitions**

Overview Tables:

- 05 Overview of all Studies
- 08 Overview of KSS and KFS
- 09 KSS Primary and Revision Outcomes
- 10 Overview Survival Rate
- 11 Overview of HSS
- 12 Overview of ROM

Literatures:

- 13 Endo-Model Knee System (WALDEMAR LINK GmbH & Co.KG)
- 39 Reference List
- 40 Further Information

Purpose of the Research

The purpose of this Literature Research is to highlight the key papers of the LINK Endo-Model Knee System. The focus is on the different scores (knee society score, knee function score, western ontario an McMaster osteoarthritis index, hospital for special surgery score and knee injury and osteoarthritis outcome score) and the survival rate.



ODEP Rating

The first
Rotating Hinge Knee System worldwide
having an ODEP rating.¹

ENDO-MODEL

STANDARD ROTATING HINGE

received a

3A ODEP
rating

A rating of 3A is given to implants that have demonstrated a better

Survival rate than 94,5% at 3 years based on data meeting ODEP's criteria for the strongest data quality. ^{1*}

The **Endo-Model Standard** received this high quality rating for a knee implant awarded by the United Kingdom's Orthopaedic Data Evaluation Panel.

1. ODEP Rating of all knees can be checked at: <http://www.odep.org.uk/products.aspx>
ODEP rating received in July 2019

* A minimum cohort of 150 hips/knees at the start of the study (consisting of data from beyond the developing centre and from more than 3 centres/surgeons) with a minimum of three years follow-up and an actual revision rate better than 94.5%. All deaths, loss to follow-up, failures and indications for revisions are recorded. A minimum of 66% prosthesis at benchmark time.

Definitions

Knee Society Clinical Rating System

The Knee Society Clinical Rating System is subdivided into a knee score and a functional score.

Knee Society Score (KSS)

The Knee Society Score Rates the pain, the range of motion and the stability of the knee. It's possible to award 100 points or different classes. Maximal 50 points for pain, 25 for range of motion and 25 for stability. (1)

Knee Functional Score (KFS)

The Functional Score rates the patient's ability to walk and climb stairs. The walking ability is expressed in blocks (100 meters). The stair climbing is considered if the patient can ascend and descend without holding the railing (1)

Evaluation of KSS and KFS

Table 1: Evaluation of KSS and KFS (1)

Score	
80-100	Excellent
70-79	Good
60-69	Fair
Below 60	Poor

Western Ontario an McMaster Osteoarthritis Index (WOMAC)

The WOMAC score is for knee and/or hip. The WOMAC evaluate the pain, stiffness and function of patients with osteoarthritis. The score is focused just on the long-term consequences. (2) The WOMAC is used for knee OA, chondral defects and anterior cruciate ligament deficiency. A higher score indicate worse pain, stiffness or physical function. (3)

Knee Injury and Osteoarthritis Outcome Score (KOOS)

The KOOS is an extension of the WOMAC score with the purpose of evaluating the short-term and long-term results. THE KOOS have five category groups: pain, other symptoms, function in daily living, function in sport and recreation and knee related quality of life. (2)

Hospital for Special Surgery-Score (HSS)

The HSS-Score evaluates pain, functional limitations, tenderness, impingement maneuvers and range of motion.

Evaluation of HSS-Score

Table 2: Evaluation of HSS-Score (4)

Score	
90-100	Excellent
80-89	Good
70-79	Fair
Below 70	Poor

Oxford Knee Score (OKS)

The Oxford Knee Score is for patients undergoing total knee replacement. The OKS evaluates pain, mobility, limping, stairs, standing after sitting, kneeling, giving way, sleep, personal hygiene, house-work, shopping and transport. Patients can award 1 to 5 points for the different classes or 0 to 4 points in the modified version. A higher score reflects a poorer outcome and consequently, lower score reflects a better outcome. (3)

Range of Motion

The Range of Motion is routinely used to judge injuries and diseases in the locomotor system. With ROM angel of flexion are measured, extension and hyperextension before and after TKA. (5)

Overview of all Studies

Study	Year of Publication	No of Patients	Mean Follow-up (Range)	Mean Age (Range)	Reason for TKA	Hinge Knee (HK) or Rotating Hinge Knee (RHK)	Primary	Revision	Scores
Primary Leng et al. (25)	2018	28	6.5 years (4-10)	72.5 years (60-81)	Osteoarthritis, Rheumatoid arthritis, Posttraumatic arthritis, charcot arthropathy	RHK	x		HSS, ROM
Gehrke et al. (6)	2014	238	More than 13 years	67 years (26-88 years)	Collateral ligament insufficiency, bony destruction of the tibial plateau or femoral condyles, hyperlaxity, fixed valgus/varus deformity, severe rheumatoid arthritis	-	x		ROM, HSS, Survival Rate
Fujiang et al. (7)	2014	30	18 months (18-48)	65.2 years (53-78)	Osteoarthritis, rheumatoid arthritis, baker knee deformity, 15°-34° deformity, 31°-45° buckling deformity	RHK	x		KSS, ROM
Bistolfi et al. (26)	2013	84	174 months (156-193)	69.1 years (34-84)	Rheumatoid arthritis, previous tibial plateau fractures, secondary arthritis that developed after high tibial ostetomy	RHK	x		HSS, Survival Rate
Lozano et al. (8)	2012	111	28 months	72.77 years	Degenerative knee joint disease	RHK	x		WOMAC, ROM
Malviya et al. (9)	2011	26	38.8 months (12-104)	80 years (67-92)	Fractures of tibia and femur	-	x		KSS, KFS
Bae et al. (10)	2009	9	12.3 years (10-22)	60.1 years (46-68)	Charcot joint	RHK	x		KSS, KFS, ROM
Mavrodontidis et al. (11)	2008	127	2-15 years	68.6 years (62.5-74.7)	Osteoarthritis	RHK	x		HSS, Survival Rate
Petrou et al. (13)	2004	80	11 years (7-15)	70 years (56-85)	Osteoarthritis, rheumatoid arthritis, osteonecrosis	RHK	x		KSS, KFS, HSS, Survival Rate

NOTE: Hyperlinks to the summary of the studies available in PDF version

Nieder et al. (14)	1996	-	More than 10 years	66 years (22-99)	Osteoarthritis, rheumatoid arthritis, posttraumatic disease, postinfection arthritis	RHK	x		Survival Rate
Bistolfi et al. (4)		97	166 months (65-193 months)	68.8 years (34-84 years)	Arthritis due to axial defects, knee arthritis due to rheumatoid arthritis, tibial plateau fractures and high tibial osteotomy	RHK	x		HSS, Survival Rate
Primary/ Revision Brown et al. (27)	2018	100	8.2 years (5-12)	73.8 years (f) 67.6 years (male)	Aseptic revision, two-stage infective revision, osteoarthritis, fracture, rheumatoid arthritis	RHK	x	x	Survival Rate
Helito et al. (28)	2018	9	12 months	67.3 years (55-83)	Varus/ valgus de-formities, infection, Recurvatum	RHK	x	x	KSS, KOOS
Yilmaz (29)	2016	28	28.95 months (14-41)	66.19 years (52-83 years)	Varus deformities, knee dislocation with degenerative arthritis, septic loosening knee dislocation after knee prosthesis, ligamentous instability, periprosthetic fracture	RHK	x	x	KSS, KFS, ROM
Atrey et al. (30)	2016	11	3.5 years (1.6- 5.5)	81.5 years (52-102)	Distal femoral fractures, periprosthetic distal femoral fractures	RHK	x	x	Oxford Knee Score
Felli et al. (15)	2016	138	6.1 years (3.5-11.2)	71.5 years (57-84)	Rheumatoid arthritis	RHK	x	x	KSS, KFS, ROM
Sanguinetti et al. (16)	2014	118	42.2 months (20-128)	74 years (50-84)	Primary: OA, rheumatoid arthritis Revision: aseptic loosening, Infection, fracture	RHK	x	x	KSS, KFS, ROM, Survival Rate
Efe et al. (17)	2012	113	55 months (10-133)	73.7 years (primary) 72.5 years (revision)	Difficult primary and complex revision cases	RHK	x	x	KSS, KFS, ROM, Survival Rate

Revision Zahar et al. (19)	2016	70	10 years (9-11)	70 years (60-81)	Prosthetic joint infection	RHK	x	HSS, Survival Rate
Rodríguez-Merchàn et al. (20)	2015	96	7.3 years (5-10)	79 years (75-86)	Instability	RHK	x	KSS, KFS, ROM
Hilgen et al. (31)	2013	29	10 years (6-13)	64 years (43-81)	Aseptic loosening	RHK, HK	x	KSS, WOMAC, Survival Rate
Bistolfi et al. (21)	2013	50	155 months (78-240 month)	69.7 years (45-85 years)	Revision because of mild and severe instability	RHK	x	HSS, ROM, Survival Rate
Gudnason et al. (22)	2010	38	8.8 years (6-18)	72 years (55-88)	Aseptic loosening	RHK	x	KSS, KFS, HSS, ROM, Survival Rate
Joshi et al. (23)	2008	78	7.83 years (56-130)	-	Aseptic loosening	RHK	x	KSS, KFS, ROM
Pradhan et al. (24)	2006	50	4 years (2-6)	70.25 years (39-85)	Infection, aseptic loosening, stiffness, fracture	RHK	x	HSS

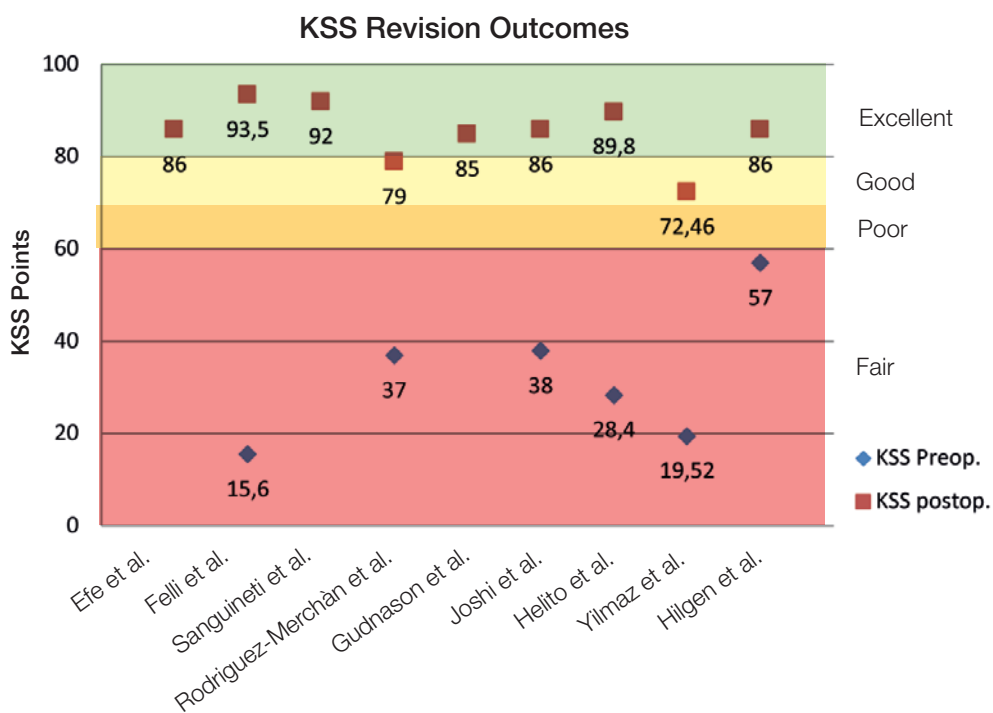
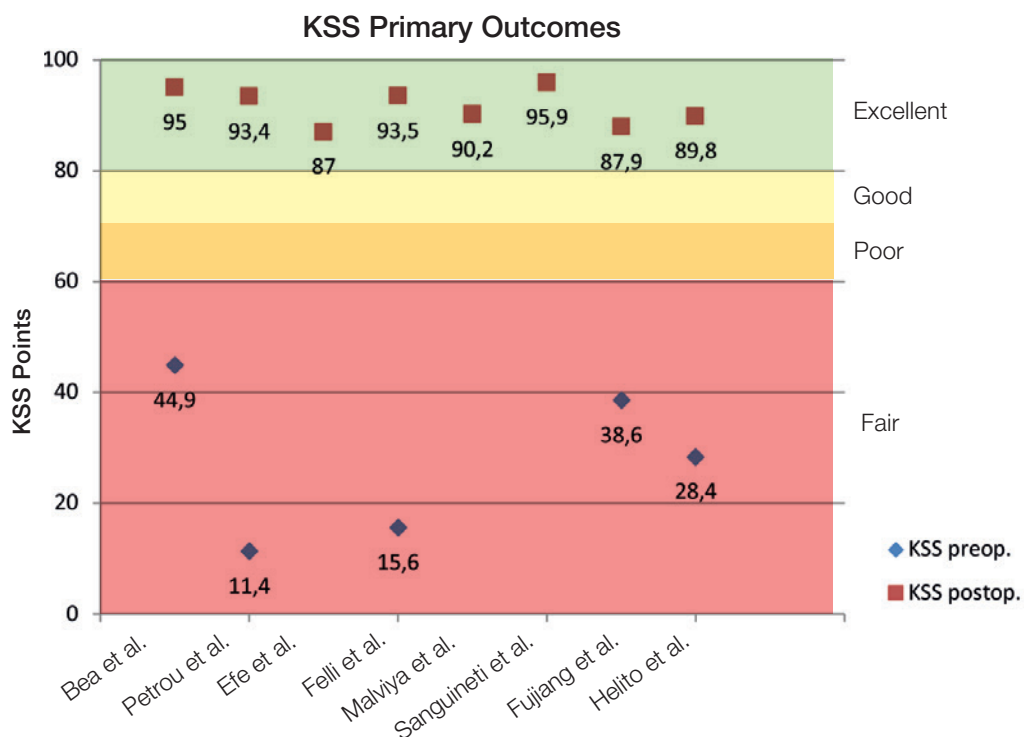
NOTE: Hyperlinks to the summary of the studies available in PDF version

Overview of KSS and KFS

Study	KSS Preoperative (Range)	KSS Postoperative (Range)	KFS Preoperative (Range)	KFS Postoperative (Range)	Primary or Revision
Bae et al. (10)	44.9 points (30-54)	95.0 points (85-98)	45.0 points (25-60)	93.6 points (80-98)	Primary
Petrou et al. (13)	11.4 points (0-46)	93.4 points (75-100)	19.7 points (0-50)	69.7 points (15-100)	Primary
Malviya et al. (9)	-	90.2 points (67-96)	-	35.5 points (-10-80)	Primary
Fujiang et al. (7)	38.6 points (+/- 12.7)	87.9 points (+/- 12.5)	36.3 points (+/- 15.1)	68.8 points (+/- 18.1)	Primary
Efe et al. (17)	-	87 points (57-97)	-	50 points (-20-100)	Primary
	-	86 points (46-94)	-	45 points (20-100)	Revision
Felli et al. (15)	15.6 points (7-30)	93.5 points (84-100)	24.3 points (2-55)	67.1 points (2-95)	Primary and Revision
Sanguineti et al. (16)	-	95.9 points	-	82.6 points	Primary
	-	92.0 points	-	86.8 points	Revision
Rodríguez-Merchán et al. (20)	37 points	79 points	34 points	53 points	Revision
Gudnason et al. (22)	-	85 points (73-96)	-	29 points (0-100)	Revision
Joshi et al. (23)	38 points (10-75)	86 points (44-98)	33 points (0-85)	61 points (20-100)	Revision
Helito et al. (28)	28.4 points (+/- 139)	89.8 (+/- 108)	-	-	Primary and Revision
Yilmaz et al. (29)	19.52 points (+/- 11.7)	72.46 points (+/- 14.01)	12.5 points (+/- 15-66)	70.36 points (+/- 9.22)	Primary and Revision
Hilgen et al. (31)	57 points (32-79)	86 points (53-99)	-	-	Revision

NOTE: Hyperlinks to the summary of the studies available in PDF version

KSS Primary and Revision Outcomes

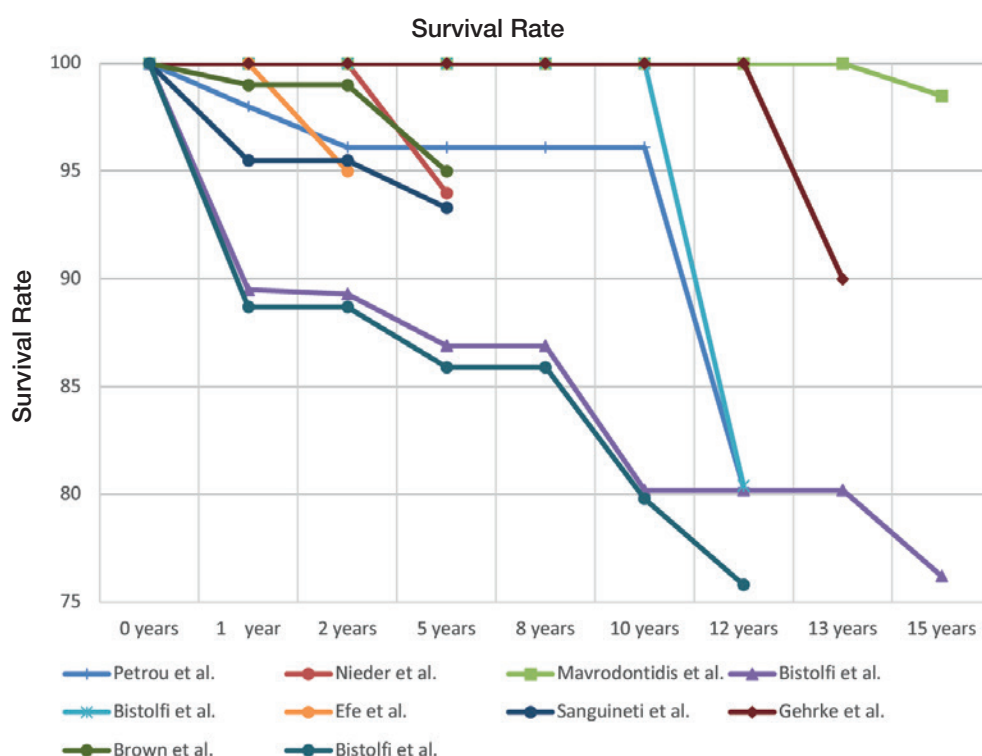


Overview Survival Rate

Study	After 1 Year	After 2 Years	After 5 Years	After 8 Years	After 10 Years	After 15 Years
Petrou et al. (13)	Primary 98%	Primary 96.1%	-	-	-	Primary 96.1%
Nieder et al. (14)	-	-	-	Primary 94%	-	-
Mavrodontidis et al. (11)	-	-	-	-	-	Primary 98.5%
Bistolfi et al. (21)	Revision 89.3%	-	Revision 86.9%	-	Revision 80.2%	Revision 76.2%
Efe et al. (17)	-	-	95% Primary 76% Revision	-	-	-
Sanguineti et al. (16)	95.5%	-	93.3%	-	-	-
Zahar et al. (19)	-	-	-	-	Revision 75%	-
Gudnason et al. (22)	-	-	-	-	Revision 89.2%	-
Bistolfi et al. (4)	-	-	-	-	Primary 80.4%**	-
Gehrke et al. (6)	-	-	-	-	-	Primary 90%***
Brown et al. (27)	99.0%	-	95.0%	-	-	-
Hilgen et al. (31)	-	-	-	-	Revision 50.0%	-
Bistolfi et al. (26)	Primary 88.7 %	-	Primary 85.9 %	-	Primary 79.8%	Primary 75.8%

* Survival rate after 12 years ** Survival rate after 12.5 years *** Survival rate after 13 years

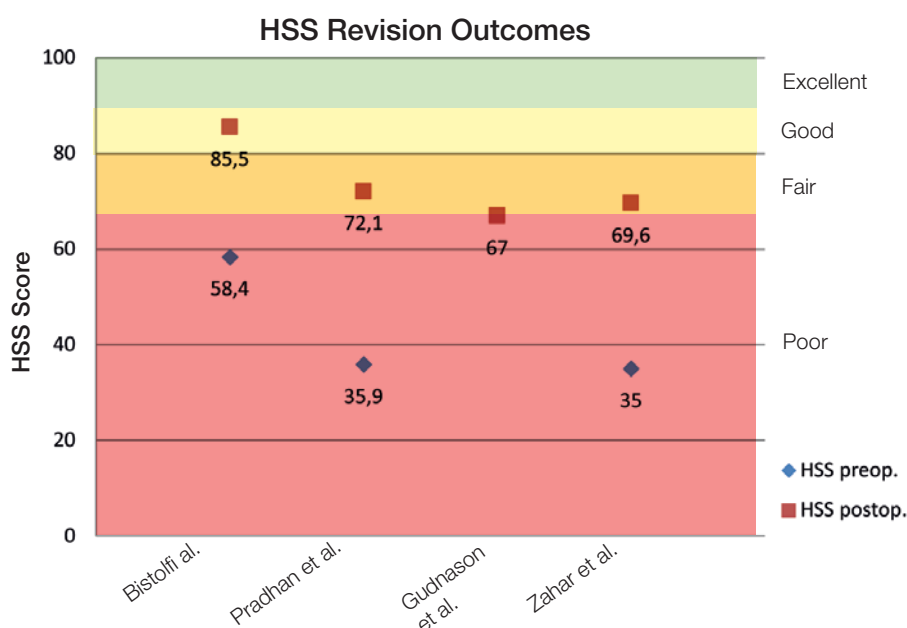
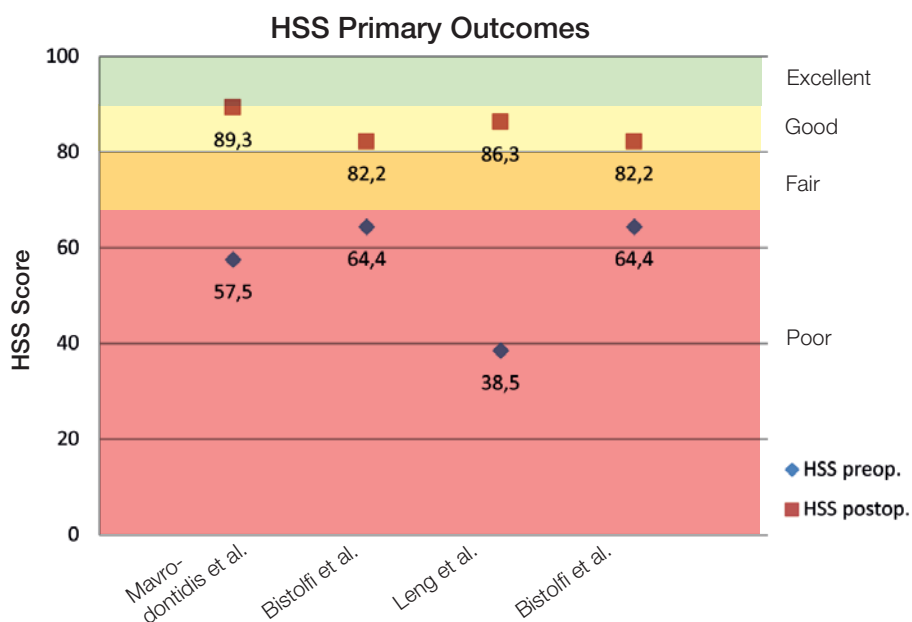
NOTE: [Hyperlinks to the summary of the studies available in PDF version](#)



Overview of HSS

Study	Pre-operative	Post-operative	Primary or Revision
Bistolfi et. al (21)	58.4 points	85.5 points	Revision
Pradhan et. al (24)	35.9 points	72.1 points	Revision
Gudnason et. al (22)	-	67 points	Revision
Zahar et. al (19)	35 points	69.6 points	Revision
Mavrodontidis et al (11)	57.5 points	89.3 points	Primary
Bistolfi et. al (4)	64.4 points	82.2 points	Primary
Leng et al. (25)	38.5 points	86.3 points	Primary
Bistolfi et al. (26)	64.4 points	82.2 points	Primary

NOTE: Hyperlinks to the summary of the studies available in PDF version

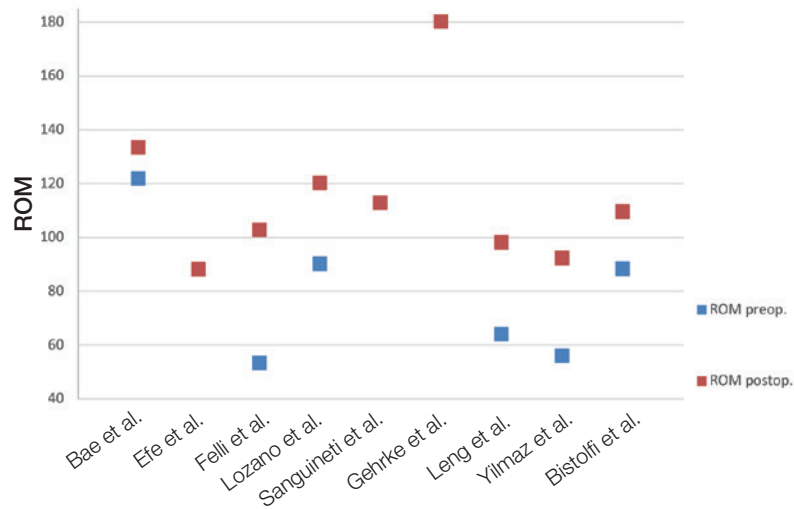


Overview of ROM

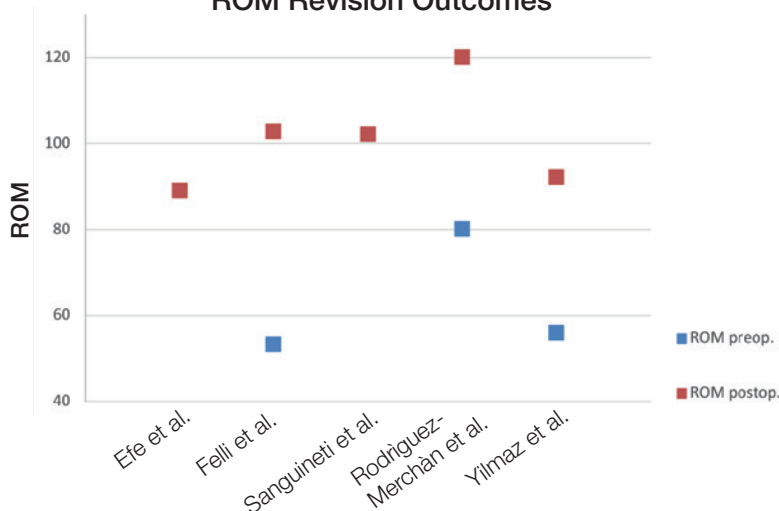
Study	ROM Pre-operative	ROM Post-operative	Primary or Revision
Bae et al. (10)	121.8° (90°-140°)	133.3° (100°-145°)	Primary
Efe et al. (17)	-	88° (63°-113°)	Primary
	-	89° (66°-112°)	Revision
Felli et al. (15)	53.2° (30°-100°)	102.7° (75°-125°)	Primary and revision
Lozano et al. (8)	90°	120°	Primary
Sanguineti et al. (16)	-	112.6°	Primary
	-	102.1°	Revision
Gehrke et al. (6)	-	118° (95°-130°)	Primary
Rodríguez-Merchàn et al. (20)	80°	120°	Revision
Leng et al. (25)	64° (20°-90°)	98° (90°-100°)	Primary
Yilmaz et al. (29)	55.95° (+/- 25.08°)	92.14° (+/- 13.47°)	Primary and Revision
Bistolfi et al. (26)	88.2° (+/- 7.6°)	109.5 (+/- 17.3°)	Primary

NOTE: Hyperlinks to the summary of the studies available in PDF version

ROM Primary Outcomes



ROM Revision Outcomes



Literature

Here follows a list of different papers related to LINK Endo-Model Knee System. These papers include information about the survival rate of the different rotating hinge knee systems and also about mid-term and long-term follow-ups (evaluated by KSS, KFS, WOMAC, KOOS or HSS scores).

Endo-Model (WALDEMAR LINK GmbH & Co.KG)

Primary Total Knee Arthroplasty with Rotating-hinge Prosthesis in severely Compromised Knees (25)

Y. Leng, M. Zeng, Y. Hu, J. Zhu, W. Su, J. Xie
Int J Clin Exp Med 2018; 11

The aim of this study was to evaluate the efficacy with Rotating Hinged knees in primary cases. The patients had the following indications: Osteoarthritis, Rheumatoid arthritis, Posttraumatic arthritis, Charcot arthropathy. The follow up was performed after 6,5 years.

Material and Methods

System: Endo-Model Rotating Hinge Prosthesis (WALDEMAR LINK GmbH & Co.KG)

Between 2006 and 2012, 28 (11 women and 17 men) primary knees were performed with the Endo-Model. The mean age of the patients was 72.5 years (range from 60 to 81 years). The mean follow-up was 6,5 years (range from 4 to 10 years).

Results

	Preoperative	Postoperative
VAS	8.1 (range from 6 to 10)	1.2 (range from 0 to 3)
HSS	38.5 (range from 25 to 62)	86.3 (range from 25 to 62)
ROM	64° (range from 20° to 90°)	98° (range from 90° to 110°)

[Overview table of all studies...](#)

Literature

[The Role of Hinges in Primary Total Knee Replacement \(6\)](#)

T.Gehrke, D. Kendoff, C. Haasper

The Bone & Joint Journal Vol 96-B, no.11 November 2014

The aim of this study was to treat patients older than 75 years with the following indications: Collateral ligament insufficiency, bony destruction of the tibial plateau or femoral condyles, hyperlaxity, fixed valgus/ varus deformity $>20^\circ$ and severe rheumatoid arthritis.

Material and Methods

System: LINK Endo-Model Rotating Hinge Prosthesis (WALDEMAR LINK GmbH & Co.KG).

In 1993 238 patients were treated with a primary prosthesis from LINK. The mean age of the patients at surgery was 67 years (range from 26 to 88). The follow-up was performed after more than 13 years.

Results

ROM postoperative was 118° (range from 95° to 130°).

The HSS has 54% excellent results, 20% good, 12% fair and 14% poor results.

The survival rate after 13 years was 90%. The survival rate of the patients older than 60 years was 97%.

Otherwise the survival rate of patients younger than 60 years was 77% after 13 years. Patients with a pre-operative varus deformity have a better survival rate after 13 years (97%) than patients with a valgus deformity (79%).

[Overview table of all studies...](#)

Literature

Clinical Outcomes of Primary Rotating-hinge Knee Arthroplasty for Knees with Severe Deformity (7)

Zhang Fujiang, Liu Yabin, Xiao Yu and Liu Wenbin
Chinese Medical Journal 2014

The aim of the study was an evaluation of patients with severe deformities. All the patients were treated with the Endo-Model. Indications for operations were: osteoarthritis, rheumatoid arthritis, 15° to 34° deformity and 31° to 45° buckling deformity.

Material and Methods

System: LINK Endo-Model Rotating Hinge Prosthesis (WALDEMAR LINK GmbH & Co.KG).

Between 2005 and 2010 the evaluate 30 patients (17 men and 13 women). The mean age of the patients at time of operation was 65.2 years (range from 53 to 78). The mean follow-up was 18 months (range from 18 to 48 months).

Results

	Preoperative	Postoperative
KSS	38.6 points (+/- 12.7)	87.9 points (+/- 12.5)
KFS	36.3 points (+/- 15.1)	68.8 points (+/- 18.1)

[Overview table of all studies...](#)

Literature

Results with 98 Endo-Modell Rotating Hinge Protheses for Primary Knee Arthroplasty (26)

A. Bistolfi, S. Lustig, F. Rosso, P. Dalmaso, M. Crova, G. Massazza
Orthopedics June 2013, Volume 36

The aim of the study was to evaluate the Endo-Model in primary cases. Between 1992 and 1995, 84 patients (70 women and 14 men, 14 bilateral implants) were performed with a Endo-Model prosthesis. The indication was Rheumatoid arthritis, previous tibial plateau fractures, secondary arthritis that developed after high tibial ostetomy.

Material and Methods

System: LINK Endo-Model Rotating Hinge Prosthesis (WALDEMAR LINK GmbH & Co.KG).

The mean age of the patients at time of operation was 69.1 years (range from 34 to 84). The mean follow-up was 174.1 month (range from 156 to 193 month). In total 98 implants were implantet. 61 patients (72 im- plants) ended the study.

Results

	Preoperative	Postoperative
HSS	64.4 +/- 8.1	82.2 +/- 13.4

The survival rate was 88.7 % after 1 year, 85.9% after 5 years, 79.8% at 10 years and 75.8% after 15 years.

[Overview table of all studies...](#)

Literature

Better Outcomes in Severe and Morbidly Obese Patients (BMI > 35 kg/m²) in Primary Endo-Model Rotating-Hinge Total Knee Arthroplasty (8)

Luis M. Lazono, Vicente Lòpez, Josè Riòs, Dragos Popescu, Pere Torner, Fèlix Castillo, and Francisco Maculé
The scientific WorldJOURNAL, 2012

The aim of the study was to show that the Endo-Model is useful for severe and morbidly obese patients with ligament instability or bone defects. This paper evaluates the results by the WOMAC and the ROM.

Material and Methods

System: LINK Endo-Model Rotating Hinge Prostheses (WALDEMAR LINK GmbH & Co.KG).

In the period from January 2006 to January 2009 they implanted 120 primary knees in 111 patients (84 female and 27 male). The minimum follow-up was one year. The mean follow-up was 28 months. The mean BMI was 30.81 kg/m². The mean age of the patients was 72.77 years.

Results

BMI	< 30 kg/m ²	>30 kg/m ²
WOMAC	-32.1 (-39.5/ 24.7)	-38.9 (-46.4/ -31.6)
Gender	Women	Men
WOMAC	-30.9 (-37.4/ 24.5)	-40.1 (-48.8/ -31.5)

ROM: The ROM the median flexion was 90° preoperative. After the surgery the median flexion was 120°.

[Overview table of all studies...](#)

Literature

Acute Primary Total Knee Arthroplasty for Peri-articular Knee Fractures in Patients over 65 Years of Age (9)

Ajay Malviya, Mike R. Reed, Paul F. Partington
Elsevier 22 June 2011

The aim of the Study was to show a follow-up of patients over 65 years with peri-articular knee fractures (both tibia and femur fractures). These fractures are difficult because of poor bone quality, pre-existing arthritis, comminution, osteochondral damage at time of injury. The cause of failure of fixation in this group of patients is not technical failure of the implant but the poor bone quality.

Material and Methods

System: LINK Endo-Model Rotating Hinge Prosthesis (WALDEMAR LINK GmbH & Co.KG).

In this paper 26 patients were treated between May 2000 and December 2008. All cases were a primary surgery to treat femoral and tibial fractures. The mean age of the patients was 80 years (range from 67 to 92 years). The mean follow-up was 38.8 months (range from 12 to 104 months).

Results

KSS	90.2 points (67 to 96 points)
KFS	35.5 points (-10 to 80 points)
OKS	39.5 cpoints (23 to 44 points)
Range of movement	87.3°

[Overview table of all studies...](#)

Literature

Long-Term Outcome of Total Knee Arthroplasty in Charcot Joint – A 10- to 22-Year Follow-up (10)

Dae Kyung Bae, MD, Sang Jun Song, MD, Kyoung Ho Yoon, MD, and Jung Ho Noh, MD
The Journal of Arthroplasty Vol. 24 No.8 2009

The aim of this study was to evaluate the long-term follow-up of patients with Charcot Joint. The Charcot Joint is characterized by development of bone destruction and attenuation of ligaments. The outcome of TKA in the Charcot joint secondary to neurosyphilis is likely to be less favorable because of the unstable neurological status, development of ataxia, severe joint destruction, bone defects and deformity.

Material and Methods

System: LINK Endo-Model Rotating Hinge Prosthesis (WALDEMAR LINK GmbH & Co.KG).

In total 9 patients and 11 TKA's were evaluated in the period from January 1985 until August 1997. This study was a retrospectively study for patients with a Charcot Joint. The mean age of the patients was 60.1 years (range from 46 to 68 years). The mean follow-up was 12.3 years. The BMI of the patients were 23.3 kg/m² (range from 20.1 kg/m² to 38.2 kg/m²).

Results

	Preoperative	Postoperative
KSS	44.9 points (range 30-54 pints)	95 points (range 85- 98 points)
KFS	45 points (range 25-60 pints)	93,6 points (range 80-98 pints)
ROM	121° (range 90°- 140°)	133.3° (range 100°-145°)

[Overview table of all studies...](#)

Literature

Application of the Endo-Model Rotating Hinge Knee Prostheses for Knee Osteoarthritis (11)

Alexandros N. Mavrodontidis, MD; Sofia I. Andrikoula, MD; Vasileios A. Kontogeorgakos, MD; George C. Babis, MD; Theodoros A. Xenakis, MD; Alexandros E. Beris, MD; and Panayotis N. Soucacos, MD, FACS
Journal of surgical orthopaedic advances volume 17, number 3, fall 2008

The aim of the study was to show results for the Endo-Model for knee osteoarthritis. The indications were osteoarthritis, rheumatoid arthritis and osteonecrosis.

Material and Methods

System: LINK Endo-Model Rotating Hinge Prosthesis (WALDEMAR LINK GmbH & Co.KG).

Between January 1990 and December 2003 they implanted 150 rotating hinge knee systems in 127 patients. The patients were subdivided into 4 groups:

	Follow-up	Mean Follow-up	Number of Knees	Number of Patients	Mean Age
Group A	10 to 15 years	12.9 years	34	30	66.8 years
Group B	8 to 10 years	9 years	35	27	69 years
Group C	5 to 8 years	6.5 years	37	31	66.4 years
Group D	2 to 5 years	4.2 years	30	25	66 years

Results

In total the HSS-Score improved from 59.3 to 90.7 (range from 83.6 to 97.8).

Parameter		Group A	Group B	Group C	Group D
HSS	Preoperative	57.5 (42.7-72.3)	59.7 (48-71.4)	62.1 (54.4-69.8)	58.9 (50.6-67.2)
	Postoperative	89.3 (83.6-95)	88.9 (79-98.8)	93.6 (90.2-97)	92.1 (86.8-97.4)
ROM	Preoperative	9.4° (8.4°-10.4°)	9.2° (7.8°-10.6°)	9.7° (8.6°-10.8°)	8.5° (7.5°-9.5°)
	Postoperative	14° (13°-15°)	13° (10.9°-15.1°)	14° (12.3°-15.7°)	14.4° (12.9°-15.9°)

[Overview table of all studies...](#)

Literature

Medium-term Results with a Primary Cemented Rotating-hinge Total Knee Replacement – A 7- to 15-Year Follow-up (13)

G. Petrou, H.Petrou, C.Tilkeridis, T. Stavrakis, T. Kapetsis, N. Kremmidas, M. Gavras
The Journal of Bone and Joint Surgery British Volume Number 86B August 2004

The aim of this study was to show mid-term results for the Endo-Model Rotating Hinge Knee TKA. To evaluate the results of this study the HSS, KSS and KFS were used.

Material and Methods

System: LINK Endo-Model Rotating Hinge Prosthesis (WALDEMAR LINK GmbH & Co.KG).

In the period from 1987 till 1995 they evaluated 100 knees in 80 patients. They used a cemented, long-stemmed Endo-Model Rotating Hinge TKA. The mean follow-up was 11 years (range from 7 to 15 years). The mean age of the patients was 70 years (range from 56 to 85 years).

Patient category:

Category	Description
A	Unilateral or bilateral
B	Unilateral, other knee symptomatic
C	Multiple arthritis or medical infirmity

Results

Knee society score and knee functional score:

Patient Category	Number of Knees	KSS		KFS	
		Preoperative	Postoperative	Preoperative	Postoperative
A	44	13.4 (0 to 46)	95.3 (90 to 110)	22.4 (0 to 50)	84.2 (70 to 100)
B	1726	12.7 (0 to 31)	93.6 (87 to 99)	22.1 (0 to 50)	71.3 (60 to 80)
C	2027	8 (0 to 38)	91.2 (75 to 99)	14.6 (0 to 40)	53.6 (15 to 80)
Total	9797	11.4 (0 to 46)	93.4 (75 to 100)	19.7 (0 to 50)	69.7 (15 to 100)

Hospital for special surgery score:

HSS	Number of Knees
85 to 100 points	70
70 to 84 points	21
60 to 69 points	6
0 to 59 points	3

Survival rate:

Years after Surgery	Survival Rate
1	98% (range from 95.5% to 100%)
2	96.1% (range from 92.2% to 99.9%)
12	80.3% (range from 68.6% to 94.1%)

[Overview table of all studies...](#)

Literature

Reconstruction of the Knee Joint Ten to Twenty Years of Knee Arthroplasty at the Endo-Klinik – A Report on the Long-term Follow-up of the St.Georg Hinge and the Medium-term Follow-up of the Rotating Knee Endo-Model (14)

Eckart Engelbrecht, Elmar Nieder and Dietrich Klüber
Springer-Verlag

The aim with the new Endo-Model Rotating Knee design was not only to improve the implantation and explantation technique but also the axial relations and the different model sizes. Also the paper wanted to investigate the effects of the modified design on the operative technique, the clinical results, prosthesis related and unrelated complications and also the survival rate and the indications.

Material and Methods

System: LINK Endo-Model Rotating Hinge Prosthesis (WALDEMAR LINK GmbH & Co.KG).

From 1981 until 1989 they implanted 1837 prostheses. The indications for an Endo-Model were osteoarthritis, rheumatoid arthritis, post-traumatic disease and post-infection arthrosis. The follow-up was between 6 to 8 years. The mean age of the patients was 66 years (range from 22 to 99 years).

Results

The survival rate is depending on the diagnoses of the patients. When the patients have the indication of osteoarthritis or rheumatoid arthritis the survival rate after 7 years is 96%. When the indication is post-traumatic disease the survivorship after 7 years is 88%. For all diagnoses the survivorship after more than 8 years is 94%.

[Overview table of all studies...](#)

Literature

Endo-Model Rotating-hinge Total Knee for Revision Total Knee Arthroplasty (21)

Alessandro Bistolfi, MD; Federica Rosso, MD; Maurizio Crova, MD; Giuseppe Massazza, MD

ORTHOPEDICS Volume 36, number 10, 2013

The aim of the study was to analyse the clinical and radiographic results and the survival rate for revision cases in mild and severe instability. The indications for revision were aseptic loosening, septic loosening, implant wear, polyethylene fracture, tibial-femoral instability, periprosthetic fracture and femorotibial dislocation. To evaluate the results they used the HSS-Score. The patients were evaluate preoperative, 3 and 6 months after the surgery and then annually.

Material and Methods

System: LINK Endo-Model Rotating Hinge Prosthesis (WALDEMAR LINK GmbH & Co.KG).

Between December 1991 and June 2004 they implanted 53 prostheses in 50 patients (33 women and 17 men). In the final follow-up 32 patients were left. The mean age of the patients was 69.7 years (range from 45 to 85 years). The mean follow-up was 155 months (range from 78 to 240 months).

Results

The ROM and HSS-Score in total:

	Preoperative	Postoperative
ROM	81.3° (77.8°-84.8°)	102.6° (97.2°-107.9°)
HSS	58.4 points (55.1-61.8 points)	85.5 points (79.6-87.5 points)

The ROM and the HSS-Score grouped in aseptic loosening, septic loosening.

Total revision and partial revision:

	Aseptic Loosening	Septic Loosening	Total Revision	Partial Revision
ROM	99.3° (88.9°-109.5°)	92.3° (90.3°-106.3°)	98.9° (93.7°-104.2°)	101.4° (96.8°-105.9°)
HSS	78.5 points (70.7-86.3 points)	77.6 points (68.4-86.8 points)	78.3 points (73.7-82.7 points)	84.8 points (82.5-87.2 points)

[Overview table of all studies...](#)

Literature

The Survivorship of the LINK Endo-rotational Hinge Total Knee Arthroplasty: 5 – 12 Years Follow-up of 100 Patients (27)

L. Brown, N. Clement, D. MacDonald, S. Breusch
Orthopaedic and Trauma Surgery, 12/2018

The aim of the study was firstly to determine the survival rate of the Endo-Model in complex primary and revision cases. Secondly to describe the complication rate and identify pre-operative independent predictors of survival.

Material and Methods

System: LINK Endo-Model Rotating Hinge Prosthesis (WALDEMAR LINK GmbH & Co.KG).

Between November 2002 and February 2010 they implanted 119 prostheses in 100 patients (41 primary knees and 59 revision knees). The mean age of the primary group was 74.2 years (range from 37.4 to 89.6 years). The mean age of the revision group was 71.1 years (range from 36.5 to 92.6 years). The mean follow-up was 8.2 years (range from 5 to 12 years).

Results

	1 Year	5 Years
Survival Rate	99 %	95%

[Overview table of all studies...](#)

Literature

Knee Arthroplasty wit Rotating-hinge Implant: an Option for Complex Primary Cases and Revisions (28)

C. Helito, P. Giglio, C. Cavalheiro, R. Gobbi, M. Demange, G. Camanho
REV BRAS ORTOP. 2018; 53(2): 151-157

The aim of the study was to present the indications, technical aspects and initial results of the first cases. In the paper the KSS and the KOOS was evaluated for the results (in complex primary and revision cases).

Material and Methods

System: LINK Endo-Model Rotating Hinge Prosthesis (WALDEMAR LINK GmbH & Co.KG).

They implanted 9 prostheses in 9 patients (6 primary knees and 3 revision knees). The mean age of the patients was 67.3 years (range from 55 to 83 years). The mean follow-up was 12 months. The indications for the paper were: Varus/ valgus deformities, infection, Recurvatum.

Results

	Preoperative	Postoperative
KOOS	26.9 (+/- 3.7)	72.9 (+/- 11.9)
KSS	28.4 (+/- 13.9)	89.8 (+/- 10.8)

[Overview table of all studies...](#)

Literature

The Impact of Joint Line Restoration on Functional Results after Hinged Knee Prosthesis (29)

S. Yilmaz, D. Cankaya, A. Deveci, A. Firat, B. Ozkurt, M. Bozkurt
Indian Journal of Orthopaedics, 2016 March-April; 50(2):136- 145

The aim of the study was to the effect of the joint line restoration on functional results. In the paper the KSS, KFS and the ROM was evaluated for the results (in primary and revision cases).

Material and Methods

System: LINK Endo-Model Rotating Hinge Prosthesis (WALDEMAR LINK GmbH & Co.KG).

Between 2008 and 2013 they implanted 28 prostheses in 28 patients (7 males, 21 female). The mean age of the patients was 66.19 years (range from 52 to 83 years). The mean follow-up was 28.95 months (range 14–41 months). The indications for the paper were: Varus deformities, knee dislocation with degenerative arthritis, septic loosening knee dislocation after knee prosthesis, ligamentous instability, periprosthetic fracture.

Results

	Preoperative	Postoperative
ROM	55.95° (+/- 25.08°)	92.14° (+/- 13.47°)
KSS	19.52 (+/- 11.7)	72.46 (+/- 14.01)
KFS	12.5 (+/- 15.66)	70.36 (+/- 9.22)

[Overview table of all studies...](#)

Literature

A 3 Year Minimum Follow-up of Endoprosthetic Replacement for Distal Femoral Fractures – An Alternative Treatment Option (30)

A. Atrey, N. Hussain, O.Gosling, P. Giannoudis, A. Shepherd, S. Young, J. Waite
Journal of Orthopaedics 14 (2017) 216-222

The aim of the study was to show 3 years follow up of patients treated with an Endo-Model in distal femoral fractures. In the paper the Oxford Knee Score was evaluated for the results (in primary and revision cases).

Material and Methods

System: LINK Endo-Model Rotating Hinge Prosthesis (WALDEMAR LINK GmbH & Co.KG).

Between 2007 and 2012 they implanted 12 prostheses in 11 patients. The mean age of the patients was 81.5 years (range from 52 to 102 years). The mean follow-up was 3.5 years (range 1.6 to 5.5 years). The indications for the paper were: Distal femoral fractures, periprosthetic distal femoral fractures.

Results

The Oxford Knee Scores were 32/48 Pre/Post-OP, respectively.

[Overview table of all studies...](#)

Literature

The Endo-Model Rotating Hinge for Rheumatoid Knees - Functional Results in Primary and Revision Surgery (15)

L. Felli; M. Coviello, M. Alessio-Mazzola, M. Cutolo
Orthopäde November 2015

The aim of this study was to show the functional results in primary and revision surgery for patients with rheumatoid arthritis. To evaluate the results the KSS, KFS, ROM and the survival rate were used. Patients with rheumatoid arthritis have a higher risk for peri- and postoperative complications.

Material and Methods

System: LINK Endo-Model Rotating Hinge Prosthesis (WALDEMAR LINK GmbH & Co.KG).

Between 1997 and 2011 they performed 152 TKA in 138 patients. In 88 cases it was a primary surgery and in 64 cases a revision surgery. The mean age of the patients was 71.5 years (range from 57 to 84 years). The mean follow-up was 6.1 years (range from 3.5-11.2 years).

Results

Survival rate: 91.7% after 6.1 years

	Preoperative	Postoperative
KSS	15.6 points (7 to 30 points)	93.5 points (84 to 100 points)
KFS	24.3 points (2 to 55 points)	67.1 points (2 to 95 points)
ROM	53.2° (30° to 100°)	102.7° (75° to 125°)

[Overview table of all studies...](#)

Literature

Total Knee Arthroplasty with Rotating-hinge Endo-Model Prosthesis: Clinical Results in Complex Primary and Revision Surgery (16)

F. Sanguineti, T. Mangano, M. Formica, F. Franchin
Arch Orthop Trauma Surg, Springer Verlag, 2014

This study shows the results with the rotating hinge knee system from LINK in complex primary and revision surgeries. For these results the KSS, KFS and ROM were used. The indications for the primary cases were osteoarthritis, post-traumatic osteoarthritis, and rheumatoid arthritis. The indications for the revision cases were aseptic loosening, infection or periprosthetic fracture.

Material and Methods

System: LINK Endo-Model Rotating Hinge Prosthesis (WALDEMAR LINK GmbH & Co.KG).

Between 1997 and 2009 they implanted 123 implants in 118 patients. 75 of the implants were primary implants and 48 revision implants. In the end they evaluated 25 primary and 20 revision cases. The mean age of the patients was 74 years (range from 50 to 84 years). The mean follow-up was 42.2 months (range from 20 to 128 months).

Results

	ROM	KSS	KFS
Primary	112.6°	95.9 points	86.8 points
Revision	102.1°	92.0 points	77.6 points
Total	108° (70°-125°)	94.2 points (71-100 points)	78.7 points (0-100 points)

They found no significant difference between the KSS in primary and revision cases.

[Overview table of all studies...](#)

Literature

Mid-term Results after Implantation of Rotating-hinge Knee Prostheses: Primary Versus Revision (17)

Turgay Efe, Philip P. Roessler, Thomas J. Heyse, Carsten Hauk, Caroline Pahrman, Alan Get-good, Jan Schmitt

Orthopedic Reviews 2012; Volume 4:e35

The aim of this study was to show the mid-term results and survivorship for the Endo-Model. To evaluate the results they used the KSS, ROM and the survival rate in primary and revision surgery.

Material and Methods

System: LINK Endo-Model Rotating Hinge Prosthesis (WALDEMAR LINK GmbH & Co.KG).

They implanted 121 prostheses in 113 patients between 1995 and 2005. In the primary cases 46 females and 7 males were operated on. In the revision cases they operated on 42 females and 17 males. The mean follow-up was 55 months (range from 10 to 133 months). The average BMI was in the primary cases 30 kg/m² (range of 17.7 kg/m² to 37.7 kg/m²). In the revision cases the average BMI was 30 kg/m² (range from 19.1 kg/m² to 47.3 kg/m²). The mean age of the primary patients was 73.7 years and the mean age of the revision patients was 72.5 years.

Results

	Primary	Revision
KSS	87 points (57 points to 97 points)	86 points (46 points to 94 points)
KFS	50 points (0 points to 100 points)	45 points (0 points to 100 points)
ROM	88+/-25°	89+/-23°
Survival rate	95% after final follow-up	76% after final follow-up

[Overview table of all studies...](#)

Literature

Can Good Infections Control Be Obtained in One-stage Exchange of the Infected TKA to a Rotating Hinge Design? 10-year Results (19)

Akos Zahar MD, Daniel O. Kendoff MD, PhD, Till O. Klatte MD, Thorsten A. Gehrke MD
Clinical Orthopaedics and Related Research, 23 June 2015

The aim of the study was to show if good infection control could be obtained in one-stage exchange of the infected TKA to a Rotating Hinge design. The target was to show the survival rate of the prosthesis without any infection or revision.

Material and Methods

System: LINK Endo-Model Rotating Hinge Prosthesis (WALDEMAR LINK GmbH & Co.KG).

They evaluated 70 patient with prosthetic joint infection. The mean follow-up was 10 years (range from 9 to 11 years). The mean age of the patients was 70 years (range from 60-81 years). 31 of the patients were female and 39 male.

Results

The survival rate without any reoperation after 10 years was 75 %.

	HSS
Preoperative	35 points (13 to 99 points)
Postoperative	69.6 points (22 to 100)

[Overview table of all studies...](#)

Literature

Revision Knee Arthroplasty with a Rotating-hinge Design in Elderly Patients with Instability Following Total Knee Arthroplasty (20)

E. Carlos Rodríguez-Merchàn MD, PhD; Primitivo Gómez-Cardero MD; Àngel Matrènez-Lloreda MD
Journal of Clinical Orthopaedics and Trauma 6, 2015

The aim of the study was to show the clinical, functional and radiographic outcomes of patients with a revision surgery. 10-22% of the revisions were due to instability of the knee prosthesis. Instability is the third most frequent cause of failure by primary implants. To evaluate the results they checked the KSS, KFS and ROM.

Material and Methods

System: LINK Endo-Model Rotating Hinge Prosthesis (WALDEMAR LINK GmbH & Co.KG).

They implanted 96 implants in 72 women and 24 men. The mean age of the patients was 79 years (range from 75 to 86 years). The mean follow-up was 7.3 years (range from 5 to 10 years). The mean BMI was 30 kg/m² (range from 17 to 51 kg/m²). All femur and tibia implants are cemented.

Results

	Preoperative	Postoperative
KSS	37 points	79 points
KFS	34 points	53 points
ROM	-15° extension and 80° flexion	-5° extension and 120° flexion

[Overview table of all studies...](#)

Literature

10-Year Results Following Impaction Bone Grafting of Major Bone Defects in 29 Rotational and Hinged Knee Revision Arthroplasties. A Follow-up of a Previous Report (31)

V. Hilgen, M. Citak, E. Vettorazzi, C. Haasper, K. Day, M. Amling, T. Gehrke, M. Gebauer
Acta Orthopaedica 2013; 84 (4): 387-391

The aim of the study was whether bone grafting provides long-term reconstruction of bone stock in the treatment of major bone defects in revision cases with the Endo-Model. In the paper the KSS, WOMAC and the Survival rate was evaluated for the results (in revision cases).

Material and Methods

System: LINK Endo-Model Rotating Hinge Prosthesis (WALDEMAR LINK GmbH & Co.KG).
LINK Endo-Model Pure Hinge Prosthesis (WALDEMAR LINK GmbH & Co.KG).

Between 1996 and 2006 they implanted 29 prostheses in 29 patients (11 Rotating Hinge, 18 Pure Hinge Prosthesis). The mean age of the patients was 64 years (range from 43 to 81 years). The mean follow-up was 10 years (range 6 to 13 years). The indications for the paper were: Aseptic loosening.

Results

	Preoperative	Postoperative
Knee Score	57 points (32- 79 pints)	86 points (53-99 points)
KFS	49 points (15- 80 points)	81 points (30- 100 points)
KSS		Mean improvement was 60 points
WOMAC	70 (26-98)	38 (10-91)

The survival rate was 50% after 10 years.

[Overview table of all studies...](#)

Literature

Results with the Endo-Model Rotating Hinged Knee Prosthesis after 18-years of Follow-up (4)

Alessandro Bistolfi, MD; Giuseppe Massazza, MD Prof.; Federica Rosso, MD; Carla Olivero, MD; Francesco Lagalla, MD; Maurizio Crova, MD Prof.

Department of Orthopedics and Traumatology, University of the Studies of Turin, CTO/M. Adelaide Hospital, Turin, Italy

The aim of the study was to show the clinical results for the Endo-Model after 18 years of follow-up. The indications were arthritis due to axial defects, rheumatoid arthritis, tibial plateau fractures and outcomes of high tibial osteotomy. To evaluate the results they used the HSS-Score.

Material and Methods

System: LINK Endo-Model Rotating Hinge Prosthesis (WALDEMAR LINK GmbH & Co.KG).

Between November 1992 and July 2003 they implanted 114 prostheses in 97 patients (13 males and 84 females). The mean age of the patients was 68.8 years (range from 37 to 84 years). The mean follow-up was 166 month (range from 65 to 193 months). For the results the HSS Score was evaluate preoperative, 3 months after the surgery, 6 months after the surgery and then annually.

Results

Survival rate after 1 year was 89.3%, after 5 years 86.9% and after 15 years 76.2%.

	Preoperative	Postoperative
ROM	89.4° (86.5°-92.3°)	110.3° (105.5°-114.9°)
HSS-Score	64.4 points (62.3-66.6 points)	82.2 points (75.5-85.9 points)

[Overview table of all studies...](#)

Literature

Implant Survival and Outcome after Rotating-hinge Total Knee Revision Arthroplasty: a Minimum 6-years Follow-up (22)

Asgeir Gudnason, Jan Milbrink, Nils P.Hailer
Arch Orthop Trauma Surg, Springer-Verlag, 2010

The aim of the study was to show the survival of a rotating-hinge total knee revision arthroplasty. To evaluate the results the HSS, KSS, KFS and the ROM were used. The indication was aseptic loosening of the primary Implant.

Material and Methods

System: LINK Endo-Model Rotating Hinge Prosthesis (WALDEMAR LINK GmbH & Co.KG).

Between 1991 and 2003 they implanted 42 implants in 38 patients (26 women, 12 men). The mean age of the patients was 72 years (range from 55 to 88 years). The mean follow-up was 8.8 years (range from 6 to 18 years).

Results

HSS	67 points (36-90 points)
KSS	85 points (73-96 points)
KFS	29 points (0-100 points)
ROM	Mean knee flexion 108° (100°-120°)

[Overview table of all studies...](#)

Literature

Is there a Place for Rotating-Hinge Arthroplasty in Knee Revision Surgery for Aseptic Loosening? (23)

Nayana Joshi, MD, PhD and Antonio Navarro-Quilis, MD, PhD

The Journal of Arthroplasty Vol. 23 No 8, 2008

The aim of the study was to show the results for knee revision surgery in case of aseptic loosening, ligamentous instability, extensor mechanism failure with instability and periprosthetic fracture. To evaluate the results the KSS, KFS and ROM were used.

Material and Methods

System: LINK Endo-Model Rotating Hinge Prosthesis (WALDEMAR LINK GmbH & Co.KG).

Between January 1993 and March 2002 78 knees were implanted in 78 patients (15 men and 63 female). The mean age of the patients was 72 years (range from 53 to 88 years). The mean follow-up was 7.83 years (range from 56 to 130 months).

Results

	Preoperative	Postoperative
KSS	38 points (10 to 75 points)	86 points (44 to 98 points)
KFS	33 points (0 to 85 points)	61 points (20 to 100 points)
ROM (extension)	-4° (-20° to 0°)	-1° (-20° to 0°)
ROM (flexion)	103° (90° to 135°)	97° (50 to 130°)

[Overview table of all studies...](#)

Literature

Salvage Revision Total Knee Replacement Using the Endo-Model Rotating Hinge Prosthesis (24)

N.R. Pradhan, L. Bale, P. Kay, M.L. Porter
The Knee 11 (Elsevier), 2004

The aim of the study was to show the results for salvage revision cases with the Endo-Model. The indications were infection, aseptic loosening, implant failure, stiffness, peri-prosthetic fracture. The results were evaluated by the HSS-Score.

Material and Methods

System: LINK Endo-Model Rotating Hinge Prosthesis (WALDEMAR LINK GmbH & Co.KG).

They implanted 51 prosthesis in 50 patients (29 females and 21 males). The mean age of the patients was 70.25 years (range from 2 to 6 years). The mean follow-up was 4 years (range from 2 to 6 years). The clinical and radiological results were evaluated.

Results

The HSS increased from 35.9 points (poor) to 72.1 points (good).

HSS	Excellent	Good	Fair	Poor
Preoperative	0	0	1	22
Postoperative	11	22	10	8

After one year of follow-up the ROM was 89.9° (range from 40° to 110°).

[Overview table of all studies...](#)

Literature

Complications Following Rotating Hinge Endo-Model (LINK) Knee Arthroplasty (18)

B. Guenoun, L. Latargez, M.Freslon, G, Defossez, N.Salas, L.-E. Gayet

Elsevier Masson, Orthopadics & Traumatology: Surgery & Research (2009) 95, 529-536

The aim of this study was to evaluate the complications with the Endo-Model. Indications for primary surgery were: primary gonarthrosis with ligament laxity, varus/valgus, tumor and secondary gonarthrosis (Posttraumatic, Rheumatoid arthritis). Indications for revision surgery were: Sepsis and aseptic loosening.

Material and Methods

System: LINK Endo-Model Rotating Hinge Prosthesis (WALDEMAR LINK GmbH & Co.KG).

Between 1998 and 2006 they implanted 85 Endo-Model in 85 patients (61 females and 24 males). 52 patients get a primary surgery and 33 a revision surgery. The mean age of the patients at time of operation was 72.4 years (range from 32 to 92 years). The mean follow-up was 36 months (range from 0 to 75 months).

Results

The Survival Rate after 1 year was 75.1 % and after 3 years 65.2%.

[Overview table of all studies...](#)

Statement Mr. Helmut D. Link (22.02.2010):

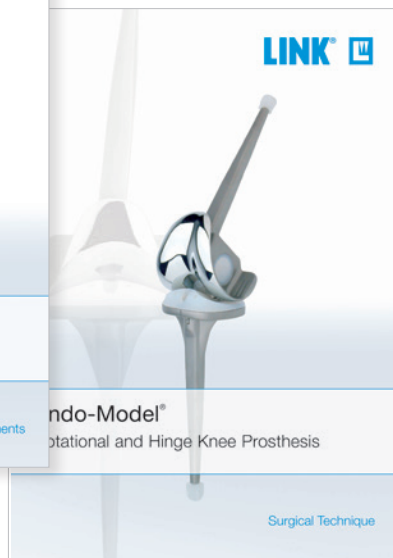
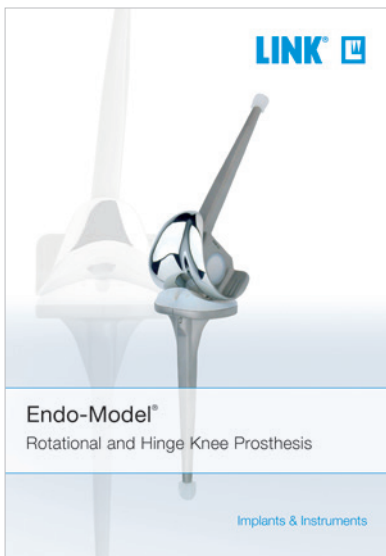
The authors report on follow-up of 85 patients which have been operated between 1998 and 2006 with 85 Endo-Model Rotating Hinge Prostheses. The report states an unusually high (28.2%) complication rate. Interestingly, the complications listed in table 2 are almost totally surgeon or patient related. Starting with infections (10.6%) via patella problems (the authors state "a patellar prosthesis was never implanted") up to synovitis shock reaction, ischemia nerve involvement and cutaneous complications. It is really incomprehensible why the authors make the implant responsible for their own mistakes and failures (this is similar if a bad driver, causing many traffic accidents, blames it to the performance of his car).

From the article itself it becomes clear that the problems are originated by the authors. Looking at the highest complication, the infection with the rate of 10.6% in only 85 patients compared to 2% in 210 patients (Reignier) or 2% in 1837 respectively 2682 patients (Nieder, Zink).

Finally, the first sentence of this publication stating "Rotating Hinge Knee Prosthesis are indicated in revision especially when major ligament laxity or substantial AP deformities are present". This is in direct conflict with the author's directions that the rotating hinge should never be used in ligament laxity or severe deformation (Nieder E. "Sled Prosthesis, Rotating Knee and Hinge Prosthesis Model St. Georg and Endo-Model: Differential therapy in primary knee arthroplasty").

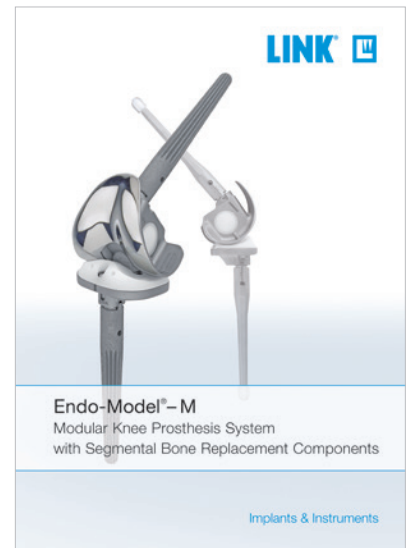
Conclusively, one can state that in this publication wrong indications, performance deficiencies and irregular methods are blamed on the worldwide highly successful Endo-Model Rotating Hinge Prosthesis that serves patients and surgeons extremely well in about 150.000 cases for over 31 years.

- (1) John N. Insall, Lawrence D. Dorr, Richard D. Scott, W.Norman Scott
Rationale of The Knee Society Clinical Rating Syst.
Clin. Orthop, 1989
- (2) Ewa M. Roos, L. Stefan Lohmander
The Knee injury and Osteoarthritis Outcome Score (KOOS): from joint injury to osteoarthritis
Health and Quality of Life Outcomes, 2003.
- (3) Natalie J. Collins, Devyani Misra, David T. Felson, Kay M. Crossley, Ewa M. Roos
Measures of knee function: International Knee Documentation Committee (IKDC) Subjective Knee Evaluation Form, Knee Injury and Osteoarthritis Outcome Score (KOOS), Knee Injury and Osteoarthritis Outcome Score Physical Function Short Form (KOOS-PS), Knee Ou
Arthritis Care & Research, 2011.
- (4) A. Bistolfi, G. Massazza, F. Rosso, C. Olivero, F. Lagalla, M. Crova
Results with the Endo-Model Rotating Hinged Knee Prosthesis after 18 Years of Follow-up
University of Turin: Department of Orthopedics and Traumatology
- (5) A. Roaas, GB. Andersson
Normal Range of Motion of the Hip, Knee and Ankle Joints in Male Subjects, 30-40 Years of Age
Acta Orthop Scand., 1982
- (6) T. Gehrke, D. Kendoff, C. Haasper
The Role of Hinges in Primary Total Knee Replacement
TZH BONE & JOINT JOURNAL, 2014
- (7) Z. Fujiang, L. Yabin, X. Yu, L. Wenbin
Clinical Outcomes of Primary Rotating-hinge Knee Arthroplasty for Knees with Severe Deformity
Chinese Medical Journal, 2014
- (8) L.M. Lazano, V. Lopez, J. Rios, D. Popescu, P. Torner, F. Castillo, F. Macule
Better Outcomes in Severe and Morbid Obese Patients (BMI>35kg/m²) in Primary Endo-Model Rotating-Hinge Total Knee Arthroplasty
The Scientific World JOURNAL, 2012
- (9) A. Malviya, M.R. Reed, P.F. Partington
Acute Primary Total Knee Arthroplasty for Periarticular Knee Fractures in Patients over 65 Years of Age
ELSEVIER, 2011
- (10) Dae Kyung Bae, Sang Jun Song, Kyoung Ho Yoon, Jung Ho Noh
Long-Term Outcome of Total Knee Arthroplasty in Charcot Joint: A 10- to 22-Year Follow-up
THE JOURNAL OF Arthroplasty, 2009
- (11) A.N. Mavrodontidis, S.I. Andrikoula, V.A. Kontogeorgakos, G.C. Babis, T.A. Xenakis, A.E. Beris, P.N. Soucacos
Application of the Endomodel Rotating Hinge Knee Prosthesis for Knee Osteoarthritis
Journal of surgical orthopaedic advances, 2008
- (12) J.A. Anderson, A. Baldini, J.H. MacDonald, P.M. Pellicci, T.P. Sculco
Primary Constrained Condylar Knee Arthroplasty without Stem Extensions for the Valgus Knee
Clinical Orthopaedics and related research, 2006
- (13) G. Petrou, H. Petrou, C. Tilkeridis, T. Stavakis, T. Kapetsis, N. Kremmidas, M. Gavras
Medium-term Results with Primary Cemented Rotating-hinge Total Knee Replacement - A 7- to 15- Year Follow-up
THE JOURNAL OF BONE & JOINT SURGERY (Br), 2004
- (14) E. Nieder, E. Engelbrecht, D. Klüber
A Report on the Long-term Follow-up of the St. Georg Hinge and the Medium-term Follow-up of the Rotating Knee Endo-Model
Springer-Verlag, 1996
- (15) L. Felli, M. Coviello, M. Alessio-Mazzola, M. Cutolo
The Endo-Model Rotating Hinge for Rheumatoid Knees
Orthopäde, 2016.
- (16) F. Sanguineti, T. M. Angano, M. Formica, F. Franchin
Total Knee Arthroplasty with Rotating-hinge Endo-Model Prosthesis: Clinical Results in Complex Primary and Revision Surgery
Arch Orthop Trauma Surg, 2014
- (17) T. Efe, P.P. Roessler, T.J. Heyse, C. Hauk, C. Pahrman, A. Getgood, J. Schmitt
Mid-term Results after Implantation of Rotating-hinge Knee Protheses: Primary Versus Revision
Orthopedic Reviews/page press, 2012
- (18) B. Guenoun, L. Latargez, M. Freslon, G. Defossez, N. Salas, L.-E. Gayet
Complications Following Rotating Hinge Endo-Model (LINK) Knee Arthroplasty
ELSEVIER MASSON, 2009
- (19) A. Zahar, O. Kendoff, T.O. Klatte, T.A. Gehrke
Can Good Infection Control Be Obtained in One-stage Exchange of the Infected TKA to a Rotating Hinge Design? 10-year Results
Clinical Orthopaedics and Related Research, 2016
- (20) E.C. Rodriguez-Merchan, P. Gomez-Cardero, A. Martinez-Lloreda
Revision Knee Arthroplasty with a Rotating-hinge Design in Elderly Patients with Instability Following Total Knee Arthroplasty
JOURNAL OF CLINICAL ORTHOPADICS AND TRAUMA, 2015
- (21) A. Bistolfi, F. Rosso, M. Crova, G. Massazza
Endo-Model® Rotating-hinge Total Knee for Revision Total Knee Arthroplasty
Orthopedics, 2013
- (22) A. Gudnason, J. Milbrink, N.P. Hailer
Implant Survival and Outcome after Rotating-hinge Total Knee Revision Arthroplasty: A Minimum 6-Year Follow-up
Arch Orthop Trauma Surg, 2010
- (23) N. Joshi, A. Navarro-Quilis
Is There a Place for Rotating-Hinge Arthroplasty in Knee Revision Surgery for Aseptic Loosening?
The Journal of Arthroplasty, 2008
- (24) N.R. Pradhan, L. Bale, P. Kay, M.L. Porter
Salvage Revision Total Knee Replacement Using the Endo-Model Rotating Hinge Prosthesis
The Knee, 2006
- (25) Y. Leng, M. Zeng, Y. Hu, J. Zhu, W. Su, J. Xie
Primary Total Knee Arthroplasty with Rotating Hinge Prosthesis in Severely Compromised Knees
Int J Clin Exp Med 2018; 11
- (26) A. Bistolfi, S. Lustig, F. Rosso, P. Dalmaso, M. Crova, G. Massazza
Results with 98 Endo-Model Rotating Hinge Protheses for Primary Knee Arthroplasty
Orthopedics June 2013, Volume 36
- (27) L. Brown, N. Clement, D. Mac Donald, S. Breusch
The Survivorship of the Link Endo-Rotational Hinge Total Knee Arthroplasty: 5 -12-Year Follow-up of 100 Patients
Orthopaedic and Trauma Surgery, 12/2018
- (28) C. Helito, P. Giglio, C. Cavalheiro, R. Gobbi, M. Demange, G. Camanho
Knee Arthroplasty with Rotating-hinge Implant: an Option for Complex Primary Cases and Revisions
REV BRAS ORTOP. 2018; 53 (2): 151-157
- (29) S. Yilmaz, D. Cankaya, A. Deveci, A. Firat, B. Ozkurt, M. Bozkurt
The Impact of Joint Line Resection on Functional Results after Hinged Knee Prosthesis
Indian Journal of Orthopaedics, 201+ 136-145
- (30) A. Atrey, N. Hussain, O. Gosling, P. Giannoudis, A. Shepherd, S. Young, J. Waite
A 3-Year Minimum Follow-up of Endoprosthetic Replacement for Distal Femoral Fractures – An Alternative Treatment Option
Journal of Orthopaedics, 2016
- (31) V. Hilgen, M. Citak, E. Vettorazzi, C. Haasper, K. Day, M. Amling, T. Gehrke, M. Gebauer
10-Year Results Following Impaction Bone Grafting of Major Bone Defects in 29 Rotational and Hinged Knee Revision Arthroplasties, A Follow-up of a Previous Report
Acta Orthopaedica 2013: 387-391



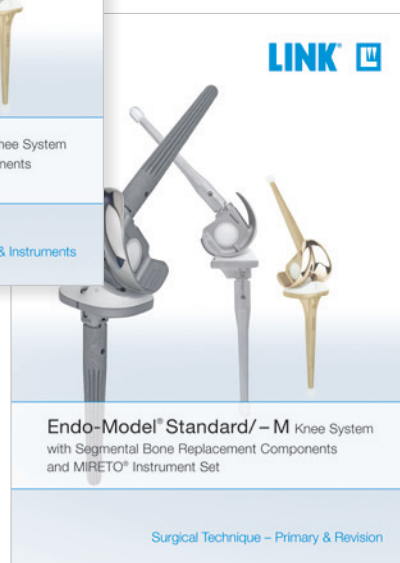
**Endo-Model
Rotational and Hinge Knee
Prosthesis System**

- Implants & Instruments
- Surgical Technique



**Endo-Model – M
Modular Knee Prosthesis System**

- Implants & Instruments
- Surgical Technique



**Endo-Model
Standard/-M Knee System with
Segmental Bone Replacement Components
and MIRETO Instrument Set**

- Implants & Instruments
- Surgical Technique - Primary & Revision



For more information please register at mediathek.linkorthopaedics.com.

Die in diesem Dokument gezeigten Produkte sind möglicherweise nicht in Ihrem Land verfügbar. Die Produktverfügbarkeit unterliegt den Zulassungs- und/oder Registrierungsvorschriften des jeweiligen Landes. Wenden Sie sich bitte an die Waldemar Link GmbH & Co. KG, wenn Sie Fragen zur Verfügbarkeit von LINK Produkten in Ihrem Land haben.

Die Waldemar Link GmbH & Co. KG und/oder andere verbundene Unternehmen besitzen, verwenden oder beantragen die folgenden Marken in vielen Ländern: LINK, BiMobile, SP II, Modell Lubinus, E-Dur, EndoDur, T.O.P. II, BetaCup, CombiCup PF, CombiCup SC, CombiCup R, MobileLink, C.F.P., LCU, SP-CL, LCP, MIT-H, Endo-Modell, Endo-Modell SL, MP, MEGASYSTEM-C, GEMINI SL, SPAR-K, LCK, HX, TiCaP, X-LINKed, PorAg, LINK PorEx, BiPorEx, PorEx-Z, TrabecuLink, Tilastan, customLink, RescueSleeve, VACUCAST. In diesem Dokument können andere Marken und Handelsnamen verwendet werden, um auf die Unternehmen zu verweisen, die die Marken und/oder Namen beanspruchen, oder auf deren Produkte. Diese Marken und/oder Namen sind das Eigentum ihrer jeweiligen Inhaber.

Waldemar Link GmbH & Co. KG

Barkhausenweg 10 • 22339 Hamburg, Germany

Tel.: +49 40 53995-0 • info@linkhh.de

www.linkorthopaedics.com

