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Long term follow-up of semi-constrained total elbow arthroplasty: a single centre retrospective analysis

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Total elbow arthroplasty (TEA) is an effective treatment for end-stage elbow arthritis and fractures, with semi-constrained designs demonstrating superior outcomes in stability and implant longevity. However, long-term survival and clinical performance data remain limited. This single-center retrospective study analyzed 122 patients who underwent semi-constrained TEA between 2003 and 2019. The cohort included 94 Coonrad-Morrey, 17 Nexel, and 11 Latitude prostheses. Clinical outcomes were assessed using Visual Analogue Scale (VAS) for pain and satisfaction, Disabilities of the Arm, Shoulder and Hand (DASH), and Mayo Elbow Performance Score (MEPS). Radiographic evaluations identified aseptic loosening and periprosthetic fractures. Kaplan-Meier survival analysis was performed to determine implant longevity. Mean follow-up durations varied across implant designs, with the Coonrad-Morrey group averaging 7.4 years. The 5-, 10-, and 15-year survival rates were 96%, 92%, and 70% for Coonrad-Morrey, 100% and 82% for Latitude (at 5 and 10 years), and 78% for Nexel at 5 years. Complication rates differed among prostheses, with Nexel showing the highest rate (41.2%), followed by Latitude (36.3%) and Coonrad-Morrey (20.6%). Functional outcomes were comparable across groups, with mean DASH scores of 33.3 (Coonrad-Morrey), 32.2 (Latitude), and 22.3 (Nexel), and mean MEPS scores of 88.7, 93.7, and 90.6, respectively.Semi-constrained TEA provides reliable pain relief, functional restoration, and implant survival, with variations in outcomes among different prosthetic designs. The Coonrad-Morrey prosthesis exhibited the highest long-term survival, while Nexel demonstrated higher early complication rates. Further longitudinal studies are needed to optimize implant design and patient selection to enhance long-term TEA performance.

Keywords: Total elbow arthroplasty, semi-constrained implants, implant survival, patient outcomes, adverse events, revision surgery.

INTRODUCTION

Total elbow arthroplasty (TEA) is a procedure most frequently used for patients with end-stage elbow arthritis secondary to rheumatoid arthritis (RA)[1]. The indications have expanded to include osteoarthritis (OA), post-traumatic arthritis (PTA) and distal humeral fractures. Less common indications are hemophilic arthropathy and reconstruction after tumor resection. Results of TEA regarding pain relief and restoration of elbow stability and function are satisfactory, but reported complications and failure rates range between 11% and 38%[2,3]. Moreover, with an annual growth rate of 8% and an increasing number of younger, more active patients undergoing the procedure, it is critical to refine implant designs to optimize long-term outcomes[3,4].

The initial TEA designs were highly constrained hinged prostheses but the high force transmission and stress at the bone-cement interface caused aseptic loosening of the humeral component and early failure[5-7]. In trying to avoid loosening, non-linked resurfacing implants were designed. These non-constrained prostheses depend on the integrity of the ulnar and radial collateral ligaments and they are less successful if these ligaments are not balanced[8]. A linked prosthesis with a semi-constrained hinge and an anterior flange was introduced by Morrey in the late 1970s[8,9]. The semi-constrained hinge allowed for some varus-valgus movement, reducing stress at the bone-cement interface while maintaining stability. The anterior flange reduced stress at the bone-cement interface while giving antero-posterior and rotational stability. As a result, semi-constrained implants have

better functional outcomes than non-constrained implants or fully constrained hinged implants[8,10].

The Coonrad-Morrey TEA (Zimmer, Warsaw, Indiana, USA) is one of the most utilized implants in recent years. It has a semi-constrained design with approximately 7° mediolateral hinge laxity. The Nexel prosthesis (Zimmer Biomet, Warsaw, IN, USA) was introduced in 2013 and has similar humeral and ulnar stem geometries to those of the Coonrad-Morrey TEA. The main design changes involved a more posterior axis of rotation compared to the Coonrad-Morrey TEA, while also a third bearing surface was added to the humeral yoke for increased compressive contact area as well as increased polyethylene thickness[3]. The Latitude prosthesis (Wright Medical Group, Memphis, TN, USA) has been in use since 2001 and is a convertible device that can be used as either an unlinked version or a linked version with 7° of mediolateral laxity. The design has an option to preserve, resect or replace the native radial head[11,12].

Several studies support the superiority of semi-constrained designs. For instance, O'Driscoll and colleagues demonstrated that semi-constrained implants exhibit lower incidences of aseptic loosening and mechanical failure, with mid-term survival rates frequently exceeding 80–90% at 10 years, while Cohen et al. noted that the biomechanical advantages of semi-constrained devices—namely improved stress distribution—contribute to enhanced durability and function[13,14]. In contrast, research on non-constrained designs has reported failure rates as high as 25% within 5 years when ligamentous insufficiency is present, underscoring the clinical benefits of a semi-constrained approach[13]. Additionally, data from the National Joint Registry indicate that patient satisfaction and implant survival are markedly improved with semi-constrained implants, likely due to their favorable biomechanical profiles, ending further support to this design strategy[15].

Satisfactory short- and medium-term results after TEA have been widely reported[11,16-18]. Successful TEA, whether semi-constrained or unconstrained, provides reliable restoration of function, relief from pain, and improvement in elbow motion[8]. Nevertheless, literature on the long-term survival rate and clinical outcomes of TEA remains scarce compared to other more common total joint replacements, such as hip, knee and shoulder implant arthroplasty.

In light of these gaps, our single-center observational study aims to provide a comprehensive long-term evaluation of semi-constrained TEA outcomes. Specifically, we will analyze implant survival, clinical performance, patient-reported outcomes, and radiographic findings in patients who underwent semi-constrained TEA at our institution between 2003 and 2019. By employing a homogeneous patient cohort and extended follow-up periods, our study seeks to overcome the methodological limitations of previous reports and clarify why the semi-constrained design may offer superior longevity and function. Ultimately, this investigation will establish more definitive benchmarks for TEA performance and inform future improvements in prosthesis design.

MATERIALS AND METHODS

This single-center retrospective study included patients who underwent semi-constrained TEA at our institution between 2003 and 2019. Ethical approval was obtained from the local Medical Ethics Committee (MP018020 UZ Leuven), and informed consent was acquired where applicable. The surgical procedures were performed by two surgeons. The patients were operated under general anesthesia in a lateral position with the arm on a padded bar. A posterior approach was used, with a distally based V-shaped triceps tendon flap, which remains attached to the olecranon as introduced by van Gorder[19]. The ulnar nerve was released and translocated anteriorly. All implants were cemented. Patients were free to mobilize their arm from the first postoperative day. A total of 122 TEA procedures were included, consisting of 94 Coonrad-Morrey (Zimmer, Warsaw, Indiana, USA), 11 Latitude (Wright Medical Group, Memphis, TN, USA), and 17 Nexel prostheses (Zimmer, Warsaw, Indiana, USA). Revision cases (n = 33) were analyzed separately due to their distinct clinical course and to avoid confounding, no duplicates were found in our database. All 122 patients were retrospectively reviewed using available medical records and contacted when possible to verify revision history. Of these 122 patients, 54 patients had deceased, and 33 agreed on a routine follow-up consultation with full clinical and radiological evaluation. Pain and functional outcomes were assessed using Visual Analogue Score for pain (VAS pain 0-10), Visual Analogue Score for satisfaction (VAS satisfaction 0-10), Disabilities of the Arm, Shoulder and Hand (DASH 0-100)[20] , Mayo Elbow Performance Score (MEPS 0-100). Range of motion (ROM) was recorded. Serial radiographic assessments classified aseptic loosening as ulnar, humeral, or combined, based on progressive bone-cement radiolucency and implant migration. All other retrospective data: age at time

of surgery, sex, implant type, side of surgery, surgical indication, post-operative adverse events, revision, indication for revision, mobility was retrospectively analyzed in the available medical records.

Statistics

Clinical outcomes and demographic data are presented as the mean and standard deviation for continuous variables, and as counts with percentages for categorical variables. The survival rate of all TEAs was evaluated using the Kaplan-Meier method with a 95% confidence interval, considering revision for any cause as the endpoint. Patients who passed away without undergoing revision were censored. A log-rank test was conducted to compare time to revision between groups. When appropriate, the Kruskal-Wallis test was used to assess differences among independent groups. Adjusted significance values were applied to mitigate the risk of Type I errors from multiple testing. Statistical significance was defined as a P value of < 0.05. All analyses were performed using SPSS (IBM Corp, 2021, IBM SPSS Statistics for Windows, Version 28.0, Armonk, NY: IBM Corp).

RESULTS

Among the 122 included patients, 41 (34%) were male and 81 (66%) were female. Right-sided prostheses were slightly more common (56%) than left-sided ones (44%). A total of 33 prostheses were revision cases, all utilizing the Coonrod-Morrey design. The primary Coonrad-Morrey prosthesis was the most frequently implanted (69%), followed by the Nexel prosthesis in 17 cases (19%) and the Latitude prosthesis in 11 cases (12%).

The surgical indications for all prostheses are detailed in Table I. Post-traumatic arthrosis was the leading indication for primary TEA, accounting for 36 cases (29.5%), followed closely by rheumatoid arthritis (28.7%). Hemophilia (6.6%) and primary osteoarthritis (4.1%) were less frequent indications.

Adverse events associated with TEA are summarized in Table II. The majority of TEAs (69.7%) remained free of complications. The most frequently reported adverse events during follow-up included periprosthetic fractures (8.2%), ulnar nerve neuropathy (7.4%), and periprosthetic joint infection (PJI) (4.1%). Table III presents adverse events by prosthetic design and revision status. The Coonrad-Morrey prostheses exhibited a complication rate of 20.6%, with periprosthetic fractures (6.3%), ulnar neuropathy (6.3%), and acute wound problems (4.8%) being the most common. No cases of periprosthetic infection were recorded in this group. The Latitude prostheses had a complication rate of 36.3%, primarily consisting of periprosthetic fractures (17.6%), radial neuropathy (9.1%), and PJI (9.1%). The Nexel prostheses had the highest complication rate (41.2%), with periprosthetic fractures (17.6%), ulnar neuropathy (5.9%), and PJI (5.9%) being most prevalent. Revision prostheses demonstrated a complication rate of 42.4%, with radial and ulnar neuropathy as well as PJI occurring in 9.1% of cases each.

Overall, 13.1% of patients required revision surgery during follow-up. Among the 16 patients undergoing revision (13.1%), 5 cases (4.1%) were due to loosening, and 5 cases (4.1%) resulted from periprosthetic fractures. Revisions due to polyethylene wear and PJI occurred in 1.6% and 3.3% of cases, respectively.

Functional and clinical outcomes varied by prosthetic design. The Coonrad-Morrey prosthesis, with a mean follow-up of 7.4 years (2-17.4 years), demonstrated a mean VAS pain score of 1.10 (0-3) and a high satisfaction score of 8.80 (7-10). Patients achieved an average flexion of 127.4 degrees (90-150) and an extension lack of 27.8 degrees (0-60). The mean range of motion (ROM) was 100 degrees (30-140), with a DASH score of 33.3 (20.8-47.5) and a MEPS score of 88.7 (60-100). Latitude prosthesis recipients, followed for an average of 7.4 years (3-13.6), reported a mean VAS pain score of 0.50 (0-1) and satisfaction of 9.25 (8-10). This group exhibited a mean flexion of 127.2 degrees (110-140), an extension lack of 16.11 degrees (0-50), a ROM of 100 degrees (60-140), a DASH score of 32.2 (20-58.3), and a MEPS score of 93.75 (90-95). The Nexel prosthesis, with a mean follow-up of 3.6 years (1.5-9.2), resulted in a VAS pain score of 2.30 (0-8) and a satisfaction score of 7.40 (3-10). Patients achieved an average flexion of 127.3 degrees (100-140), an extension lack of 29 degrees (0-60), a ROM of 99 degrees (60-140), a DASH score of 22.3 (4.2-59.2), and a MEPS score of 90.6 (70-100). The revision group (mean follow-up: 6.8 years, range 1.3-17) reported a VAS pain score of 0.89 (0-4) and a satisfaction score of 8.44 (7-10). Flexion averaged 125 degrees (110-150), with an extension lack of 21.07 degrees (0-50), a ROM of 103.9 degrees (75-135), a DASH score of 30.38 (11.7-71.7), and a MEPS score of 93.5 (85-100). These functional outcomes are summarized in Table IV.

The follow-up period significantly varied between different prosthetic groups used for primary TEA ($p = 0.01$), influenced by the availability and introduction times of the implant designs. Significant differences were identified between the follow-up duration of

Table I. — An overview of the surgical indication for the total population.

	Frequency (N)	Percentage (%)
Rheumatoïd arthritis	35	28.7
Post-traumatic arthrosis	36	29.5
Primary osteoarthrosis	5	4.1
Revision prosthesis for any indication	34	27.8
Posttraumatic pseudarthrosis	1	0.8
Psoriatic arthritis	1	0.8
Hemophilia	8	6.6
Juveline idiopatic arthritis	2	1.6
Total	122	100
N= number of indications, %		

Table II. — Adverse events of all total elbow prosthesis.

	Frequency (N)	Percent (%)
No adverse event	85	69.7
Periprosthetic fracture	10	8.2
Ulnar nerve neuropathy	9	7.4
Radial nerve neuropathy	4	3.3
Heterotopic ossification	1	0.8
Triceps insufficiency	3	2.4
Periprosthetic Joint Infection	5	4.1
Wound problem (< 6 weeks)	4	3.3
Wound problem (>6 weeks)	1	0.8
Arthrofibrosis	1	0.8
Total	122	100
N= number of adverse events, % = percentage of total adverse events.		

Table III. — Adverse events per prosthetic design.

	Revisions (Coonrad Morrey)		Latitude		Nexel		Coonrad Morrey	
	Frequency (N)	Percentage (%)	Frequency (N)	Percentage (%)	Frequency (N)	Percentage (%)	Frequency (N)	Percentage (%)
No adverse events	19	57.6	7	63.6	10	58.8	50	79.4
Periprosthetic fracture	2	6.1	2	18.2	3	17.6	4	6.3
Ulnar nerve neuropathy	3	9.1	0	0	1	5.9	4	6.3
Radial nerve neuropathy	3	9.1	1	9.1	0	0	0	0
Heterotopic ossification	1	3.0	0	0	0	0	0	0
Triceps insufficiency	1	3.0	0	0	0	0	1	1.6
Periprosthetic Joint infection	3	9.1	1	9.1	1	5.9	0	0
Wound problems (<6 weeks)	1	3.0	0	0	0	0	3	4.8
Wound problems (> 6 weeks)	0	0	0	0	0	0	1	1.6
Arthrofibrosis	0	0	0	0	1	5.9	0	0
N= the number of adverse events, %= percentage of adverse events per design.								

Table IV. — Outcomes of the the different total elbow prostheses.

Prosthetic Design		Follow-up (Years)	VAS PAIN (0-10)	VAS Satisfaction (0-10)	Flexion (0-150 degrees)	Extension loss (degrees)	ROM (degrees)	DASH (0-100)	MEPS (0-100)
Coonrad-Morrey	Mean	7.4	1.10	8.80	127.43	27.84	99.59	33.373	88.75
	N	61	10	10	37	37	37	11	8
	Std. Deviation	5.34675	1.197	0.919	14.654	16.395	23.699	10.6481	13.025
	Minimum	2	0	7	90	0	30	20.8	60
	Maximum	17.40	3	10	150	60	140	47.5	100
Latitude	Mean	7.4	0.50	9.25	127.22	16.11	100.00	32.250	93.75
	N	11	4	4	9	9	9	4	4
	Std. Deviation	4.00805	.577	0.957	13.017	26.667	23.318	17.7607	2.500
	Minimum	3.00	0	8	110	0	60	20.0	90
	Maximum	13.60	1	10	140	50	140	58.3	95
Nexel	Mean	3.6	2.30	7.40	127.33	29.00	99.00	22.313	90.63
	N	17	10	10	15	15	15	8	8
	Std. Deviation	2.00156	3.164	2.591	12.799	18.727	25.509	16.4705	10.501
	Minimum	2	0	3	100	0	60	4.2	70
	Maximum	9.20	8	10	140	60	140	59.2	100
Revisions (Coonrad-Morrey)	Mean	6.8	0.89	8.44	125.00	21.07	103.93	30.38	93.5
	N	33	9	9	14	14	14	8	4
	Std. Deviation	4.27181	1.364	1.014	12.860	15.833	18.520	17.889	6.292
	Minimum	2	0	7	110	0	75	11.7	85
	Maximum	17.00	4	10	150	50	135	71.7	100

VAS = Visual analogue score, ROM= range of motion, DASH= Disabilities of the shoulder, arm and hand score, MEPS= Mayo Elbow Performance Score. N= number.

Coonrad-Morrey and Nexel ($p = 0.02$) and between Latitude and Nexel ($p = 0.02$). However, no significant differences were observed in pain scores ($p = 0.75$), satisfaction scores ($p = 0.34$), degrees of flexion ($p = 0.98$), extension lack ($p = 0.68$), ROM ($p = 0.97$), DASH scores ($p = 0.084$), or MEPS scores ($p = 0.93$) among the different prosthetic designs.

Kaplan-Meier survival curves of the various primary TEA prosthetic designs are displayed in Figure 1. The log-rank test indicated a statistically significant difference in survival distributions ($p = 0.015$). Pairwise comparison revealed significant differences between the Coonrad-Morrey and Nexel prostheses ($p = 0.026$), while no significant differences were noted between Coonrad-Morrey and Latitude ($p = 0.398$) or Latitude and Nexel ($p = 0.205$). The primary TEA Coonrad-Morrey group exhibited a survival rate of 96% at 5 years, 92% at 10 years, and 70% at 15 years. The Latitude group had a 5-year survival of 100% and a 10-year survival of 82%. The Nexel group had a 5-year survival of 78%.

Figure 2 presents the Kaplan-Meier survival curve comparing primary and revision TEA. Revision TEA demonstrated a 5-year survival of 91%, with 10- and 15-year survival rates of 69%.

Radiographic evaluation of primary TEA revealed signs of aseptic loosening in 22.5% of cases. Ulnar component loosening was noted in 9.0% (n = 9), combined ulnar and humeral loosening in 5.6% (n = 5), and humeral loosening in 7.9% (n = 7). Among revision prostheses, 33.4% exhibited signs of aseptic loosening, with 9.1% (n = 3) showing ulnar loosening, 15.2% (n = 5) combined loosening, and 9.1% (n = 3) humeral loosening.

DISCUSSION

Patient Outcomes

The present study reports medium-term outcomes and implant survival of semi-constrained total elbow arthroplasty (TEA) in a large university hospital.

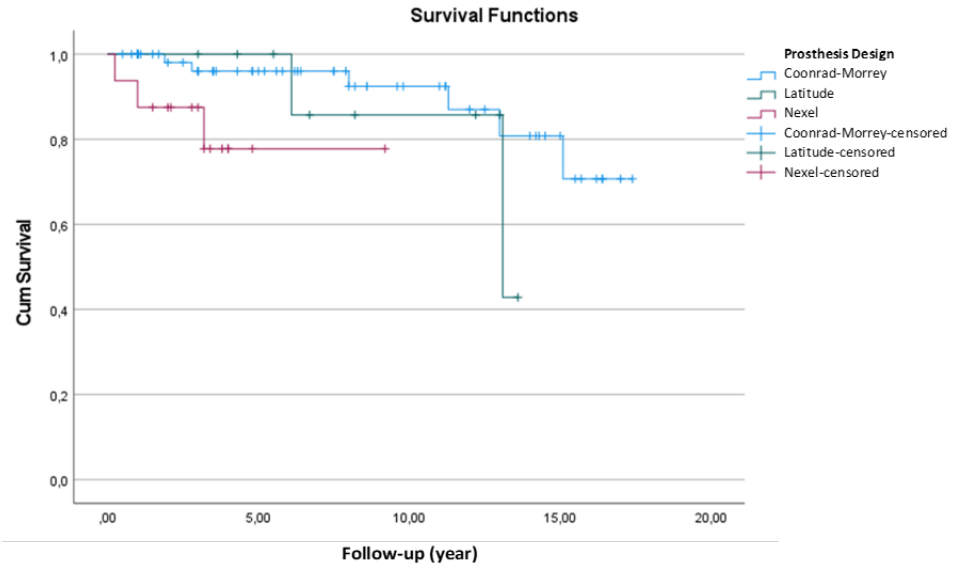

Fig. 1 — Kaplan-Meier survival graph of the different primary TEA designs. Deceased patients without revision are censored.

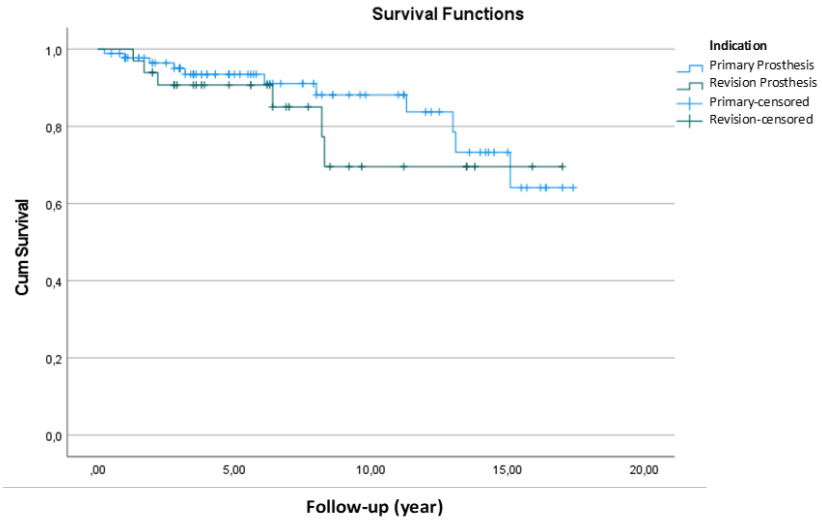

Fig. 2 — Kaplan-Meier survival graph of the primary and revision prosthesis. Deceased patients without revision are censored.

Overall, the clinical outcomes of semi-constrained TEA in this study align with previously reported findings. The Coonrad-Morrey group demonstrated a mean DASH and MEPS score of 33.3 and 88.75 (excellent) after an average follow-up of 7.4 years. These results are comparable to studies reporting MEPS scores of 89 and 90 at 10 years of follow-up[21,22]. A systematic review by Davey et al. showed similar outcomes, with DASH and MEPS scores of 39.2 and 89.1 respectively, for TEA with more than 10 years of follow-up[23]. The Latitude group reported mean DASH and MEPS scores of 32.2 and 93.7 (excellent), with a mean flexion of 127 degrees, consistent with previous literature reporting DASH and MEPS scores of 28.1 and 89.6[12]. The Nexel design exhibited a slightly worse VAS score for pain and satisfaction at 2.3 and 7, respectively, albeit non-significant. This observation parallels the relatively lower survival rate in the Nexel group.. In comparison to a recent systematic review, our revision prostheses achieved excellent functional outcomes, with a mean VAS pain score of 0.89, mean ROM of 103.9 degrees, and mean MEPS score of 93.5. These values compare favorably with literature reports indicating VAS and MEPS scores of 1.5 and 80.9, respectively, for linked designs[24]. However, despite the promising functional results, the survival rate of our revision cases decreased from 91% at 5 years to 69% at 10 and 15 years, highlighting the need for long-term monitoring.

Overall, the comparative analysis suggests minor, non-significant differences between designs, with generally favorable pain scores, satisfaction levels, and excellent functional outcomes. The Latitude group reported the lowest mean pain levels (VAS 0.5) and highest satisfaction (VAS 9.25), but these differences were not statistically significant. These findings are in line with the available literature on the clinical performance of semi-constrained elbow implants, emphasizing the overall efficacy of TEA in improving patients' quality of life.

Implant Survival and Prosthetic Designs

Our study found notable variations in survival rates among the Coonrad-Morrey, Latitude, and Nexel prosthetic designs. The Coonrad-Morrey design exhibited a 5-year survival rate of 96% and a 10-year survival rate of 92%, consistent with previous reports indicating survival rates between 90% and 92% at 10 years[21,22,25,26]. A systematic review by Evans et al. similarly reported a 10-year survival rate of 92% for linked TEA designs[27]. However, at 15 years, our study observed a decline in survival to 70%, aligning with other long-term follow-up studies that reported survival rates of 77.6% to 83% after 13 and 15 years, respectively[22,28]. At 20 years the survival in the literature even diminishes to 68%, underscoring the importance of continued vigilance and extended follow-up in TEA patients[22].

In our series, the Latitude design demonstrated a 5-year survival rate of 100%, which decreased to 82% at 10 years. This corresponds with other studies reporting 5- and 10-year survival rates of 83% and 82%, respectively[11,12].

The Nexel design, introduced as an evolution of the Coonrad-Morrey implant, exhibited a lower 5-year survival rate of 78% in our cohort. While this appears lower than other designs, it remains within the range reported in the literature, emphasizing the need to consider follow-up duration and patient selection. Notably, the significant difference in survival between the Coonrad-Morrey and Nexel designs warrants careful interpretation due to the shorter follow-up duration and smaller sample size in the Nexel group. Within this group, three revisions occurred in less than five years, two of which were due to traumatic periprosthetic fractures. These findings underscore the necessity for cautious extrapolation of results, particularly in smaller subgroups. . While our Nexel prostheses experienced early failures due to traumatic fractures, prior studies have also indicated potentially high early failure rates for the Nexel design. Morrey et al. reported revision rates of 32% after a mean follow-up of 2.2 years[3]. Siala et al. showed a 22% revision rate with 56% of adverse events within 45 months of follow-up[29]. These complications may be attributed to the Nexel's posterior center of rotation, leading to anterior impingement and subsequent osteolysis[3,29].

Importantly, the lack of statistical significance in long-term survival distributions between primary and revision TEA suggests that despite its complexity, revision surgery can yield comparable outcomes to primary procedures. This observation contrasts with prior studies that reported markedly superior results for primary prostheses[17].

Adverse Events and Revision Cases

Across all TEA cases, the most common adverse events identified were periprosthetic fractures (8.2%), ulnar nerve neuropathy (7.4%), and periprosthetic joint infection (PJI) (4.1%). Although complications were observed in 31.3% of cases, the majority of patients (86.9%) did not require revision surgery. These findings align with previous reports on linked designs, which indicate complication rates ranging from 11% to 38% [2,28]. A recent systematic review of complications in TEA with a mean follow-up of less than 5 years even showed a cumulative complication rate as high as 60.7%, including 6.5% deep infections. Nerve injury was also frequently reported with 4.1%[30]. A separate review analyzing TEA cases with more than 10 years of follow-up found an overall complication rate of 16.3%, with infection rates of 3.1% and nerve injuries in 2.1% of cases[23].

Our revision TEA had an overall complication rate of 42.4% , with neuropathies accounting for 18.2% of complications. These results correspond with a systematic review reporting a 44% complication rate and 21% postoperative neuropathy rate in revision TEA[24]. Some studies even report higher complication rates of up to 56%[31]. Our revision cases showed a 9.1% incidence of radial neuropathy, likely due to the more extensive surgical dissection required, increasing the risk of neuropraxia. PJI was also more common in our revision cases (9.1%) compared to the primary Coonrad-Morrey cases, which had no reported PJI. These findings emphasize the need for thorough preoperative risk assessment and patient counseling. Radiological loosening was identified in 22.5% of cases, most frequently affecting the ulnar component (9%). However, these findings should be interpreted cautiously due to varying follow-up durations. Davey et al. reported a loosening rate of 12.9% after 10 years of follow-up, though they did not differentiate between

linked and unlinked desig3ns[2]. Other studies have reported radiolucency rates as high as 46%–60% for the Latitude design[11,12].

Limitations

The retrospective nature of this study, varying follow-up durations, small sample size, and potential selection biases limit the generalizability of findings. Long term data (>10 years) was limited due to patient mortality and loss to follow-up. The absence of preoperative functional outcome scores also necessitates cautious interpretation. Future research should prioritize prospective, multicenter studies with standardized follow-up protocols to enhance clinical applicability. Despite these limitations, this study offers valuable insights into the long-term performance of semi-constrained TEA and highlights the ongoing need for comprehensive clinical and radiological follow-up.

CONCLUSION

This study provides comparable survival and excellent functional outcomes of the Coonrad-Morrey and Latitude designs, with Latitude demonstrating superior short-term survival. The Nexel design exhibitied significantly lower survival rates. In general, TEA is associated with a relatively high complication risk and long-term survival seems limited compared to other joint prostheses. Moreover, since not every design seems to achieve equally good results, adequate patient education and prosthesis selection remain of paramount importance to obtain optimal results.

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