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Long Term Quality of Life Outcomes Following Rotationplasty in Pediatric Population: A Scoping Review

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Background

- Rotationplasty is a surgical technique that was popularized by Van Nes in the 1950s.
- Originally used for patients with congenital proximal focal deficiency (PFFD), but it is now commonly used for patients with osteosarcoma as well.
- Involves removal of the knee joint, the distal femur and proximal tibia; the ankle joint is then rotated 180 degrees and reattached to the residual femur.
- Allows the foot and ankle to be used as a functional knee joint within a prosthesis.

Purpose

The purpose of this scoping review is to compare the long-term quality of life outcomes following rotationplasty with other limb salvage procedures and healthy, matched controls.

Subjects

The population assessed was patients who underwent rotationplasty at an average age of equal to or less than 21 years of age as a result of either proximal femoral focal deficiency (PFFD) or osteosarcoma. Participants were assessed a minimum of two years post-rotationplasty with a maximum average follow up of 25.1 years.

Methods

Three databases (PubMed, Embase, CINAHL) were searched for articles that assessed outcome measures of rotationplasty amongst pediatric patients using the Musculoskeletal Tumor Society rating scale (MSTS) and/or the Short Form 36 (SF-36) outcome measures, as described below.

Outcomes

- The Short Form Health Survey (SF-36) is a self reported outcome measure used to quantify health related quality of life.
- The Musculoskeletal Tumor Society Scale (MSTS) is a functional scale in which clinicians rate patients on their walking ability and gait, while asking the patients to rate their pain, emotional acceptance and support

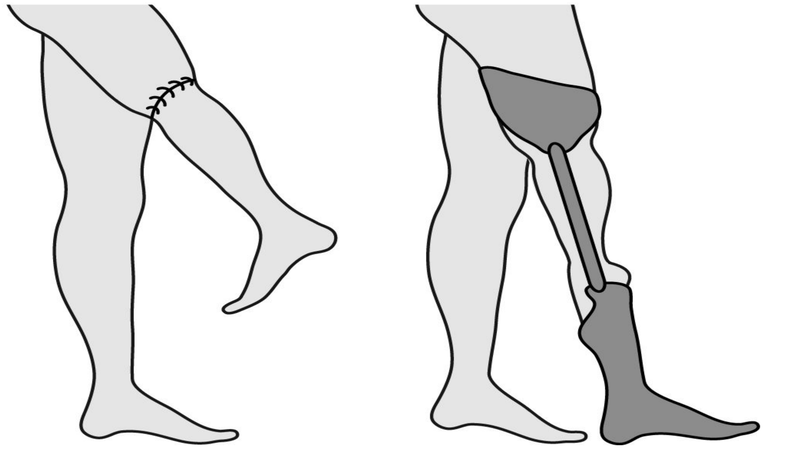

Image from Canadian Cancer Society

Results

Article	Study Design	Population	Comparison	Outcomes	Adverse Effects
Ackman *et al.*	Retrospective cohort with comparison group, mean follow-up of 25.1 years	12 patients with congenital proximal focal femoral deficiency (PFFD), Van Nes rotationplasty at mean age of 6.5 (2 to 12) years with final follow up of 25.1 years (11 to 45)	12 age- and gender- matched normal control patients without congenital musculoskeletal or neuromuscular deformities	No differences between the groups in SF-36; using CDP, rotationplasty group had reduced symmetry in stance and reduced end point the maximum excursion.	NR
Forni *et al.*	Retrospective cohort with comparison group, 2 year minimum follow -up	20 Italian patients who underwent rotationplasty due to osteosarcoma who are >16 years and >2 years post-surgery	General population	SF-36: Physical functioning (PF) subscore of rotationplasty patients (89.3 ±8.8) was significantly lower than that of the general population (P<0.05); general health (GH) and mental health (MH) were significantly higher in rotationplasty population (P<0.05); no significant difference between the groups in role-physical (RP), bodily pain (BP), vitality (VT), social functioning (SF) and role-emotional (RE) subscores	NR
Ginsberg *et al.*	Prospective study	4 patients who underwent rotationplasty due to lower-extremity bone sarcoma	Pateints who underwent surgical alternatives due to lower-extremity bone sarcoma: above knee amputation (18 subjects), below knee amputation (4), limb sparing – femur (41), limb sparing – tibia (24)	Rotationplasty group scored higher on FMA (mean=51.8±6.1) and MSTS (mean=27.5±1.9) than the above the knee amputation group (mean=42.2±8.7, P=0.05; mean=19.6±4.7, P=0.01, respectively). No significant differences were shown between these two groups on the TESS or SF-36 Rotationplasty group showed significantly higher on MSTS (mean=27.5±1.9) and TESS scores (mean=85.6±2.8) than patients who had limb-sparing femur surgery (mean=21.8±4.6, P=0.01; 86.4±9.9, P=0.04, respectively). No significant differences were shown between the two groups on FMA or SF-36	NR
Gradl *et al.*	Retrospective cohort with comparison group, mean follow up 14±9 years	12 patients who underwent rotationplasty at mean age 19±10 years.	Representative healthy sample cohort	SF-36: Vitality, social functioning and mental health subscores were significantly higher in the rotationplasty population (p=0. 0243, p=0.0001, p=0.0001 respectively) No significant differences in physical functioning, physical role, bodily pain, general health, and emotional role subscores.	Major (2 patients); moderate (1)
Veenstra *et al.*	Retrospective cohort with comparison group, mean follow up 6.3 years	33 patients who underwent rotationplasty with mean age at time of follow up of 25.3 years (16 to 50)	Sample of young, healthy controls	SF-36: Rotationplasty pts reported significantly poorer subscores of physical functioning and role-physical than comparison group; no significant differences reported in remaining subscores	Major (1 patient); Moderate (1)

Results

- Electronic database searches yielded 217 unique articles.
- A two-step process was used to assess articles for inclusion/exclusion criteria
- 5 articles met the inclusion criteria and were included for analysis

Conclusions

Overall, the articles reviewed in this paper concluded that those who had undergone the Van Nes rotationplasty procedure exhibited similar quality of life and psychosocial domain scores when compared to other procedures, as well as the general population.

Clinical Relevance

- Rotationplasty is a viable and satisfactory treatment option for appropriately selected patients
- Emphasize patient education on benefits and challenges compared to alternative procedures
- Increased MSTS scores compared to AKA and limb sparing surgeries
- Psychological benefits and increased QOL of rotationplasty may outweigh the unconventional cosmetic appearance

Acknowledgements / References

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[1] Ackman, J et al. Long-term follow-up of Van Nes rotationplasty in patients with congenital proximal focal femoral deficiency. *The Bone & Joint Journal* 2013; 95-B:192-8.
[2] Forni, C et al. Living With Rotationplasty - Quality of Life in Rotationplasty Patients From Childhood to Adulthood. *Journal of Surgical Oncology* 2012;105:331-336.
[3] Ginsberg, J et al. A Comparative Analysis of Functional Outcomes in Adolescents and Young Adults With Lower-Extremity Bone Sarcoma. *Pediatric Blood Cancer* 2007; 49:964-969.
[4] Gradl, G et al. Long-term functional outcome and quality of life following rotationplasty for treatment of malignant tumor. *BMC Musculoskeletal Disorders* 2015; 16:262.
[5] Veenstra, K et al. Quality of life in Survivors With a Van Ness-Borggreve Rotationplasty After Bone Tumour Resection. *Journal of Surgical Oncology* 2000; 73:192-197.