

Background

Surgeries of the anterior neck can lead to inadvertent injury to the parathyroid glands that results in permanent hypoparathyroidism in approximately <2% of cases.¹ The subsequent hypocalcemia leads to drastic quality-of-life impairments through intense muscular tetany, bone alterations, seizures, among other complications.¹ Large doses of calcium and vitamin D is currently the standard of care but is burdensome in adherence, limited in efficacy, and increases risk of soft tissue calcifications.² Parathyroid allotransplantation offers promise in restoring functional parathyroid tissue in patients with permanent hypoparathyroidism. However, graft rejection is a major hurdle in achieving successful parathyroid allotransplantation.³

Objective

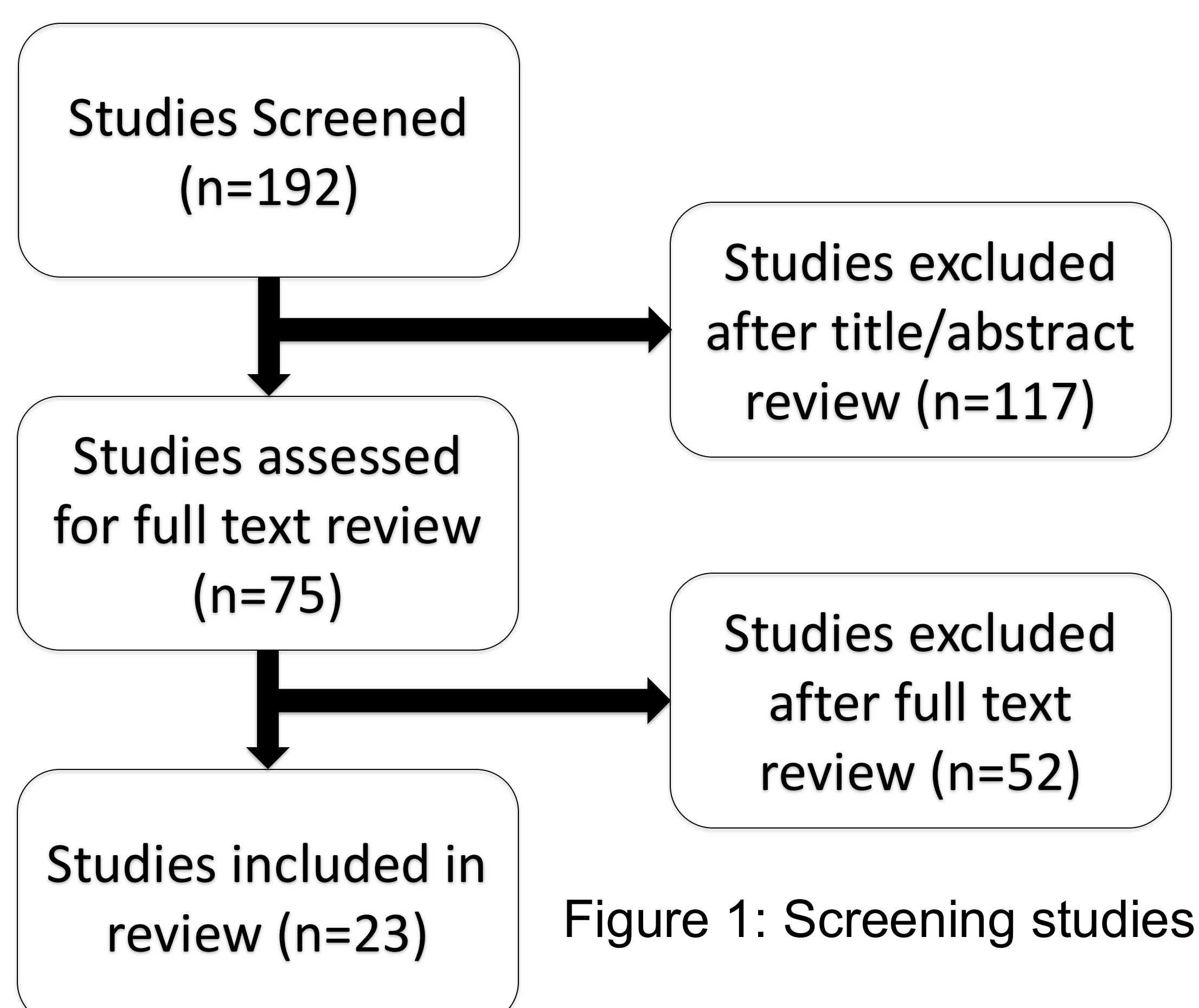
Perform a systematic review to assess the efficacy of parathyroid allotransplantation in adult patients with permanent hypoparathyroidism

Methods

We conducted an electronic search across MEDLINE, EMBASE, EBSCO CINAHL, Scopus, ProQuest Dissertation and Theses Global, and Cochrane Library, yielding 192 articles. Among them, 23 articles met inclusion criteria (Table 1) as depicted in Figure 1. The Methodological Index for Non-Randomized Studies (MINORS) criteria assessed the included text's quality. Two independent reviewers extracted relevant data, including parathyroid donor and recipient characteristics, pre- and post-transplant parathyroid hormone (PTH) and calcium levels, ongoing need for calcium and vitamin D supplementation, and the immunosuppression regimen.

Table 1: Criteria

Inclusion Criteria	Exclusion Criteria
<ul style="list-style-type: none"> Primary research articles in English Adult patients (≥18 years) Endpoints of transplantation success at various follow-up time points 	<ul style="list-style-type: none"> Review articles, conference presentations Articles on pediatric hypoparathyroidism



Results

Table 2: Patient characteristics

Total patients	122
Total transplants	165
Sex	31 females, 2 males, 89 unknown*
Age (years)	mean 44.8 years (range 18-61 years)
Indications for parathyroid allotransplantation	Post total thyroidectomy Post total parathyroidectomy with failed autotransplant Congenital absence of parathyroid glands (N=1)

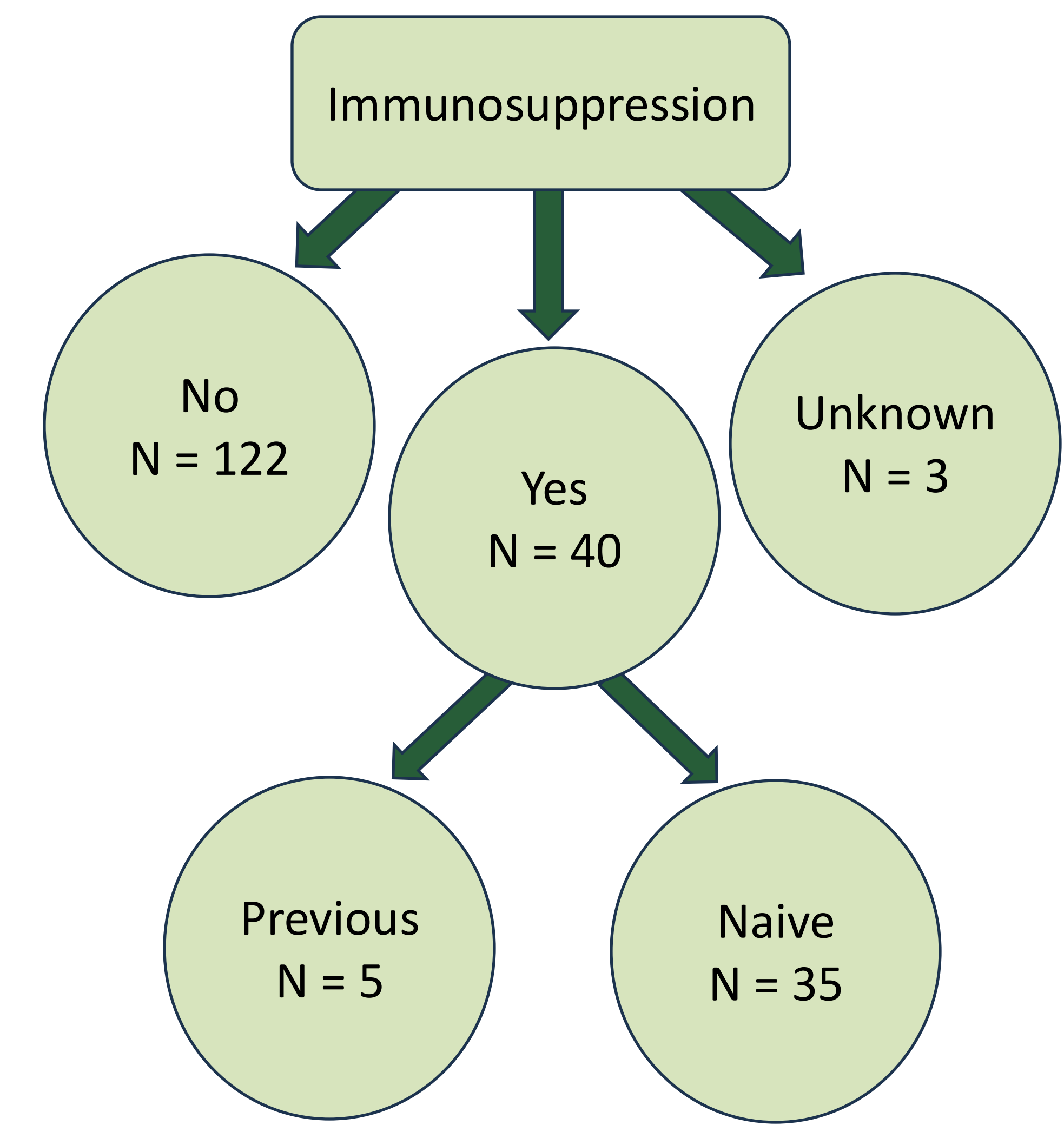


Figure 2: Number of transplant recipients receiving an immunosuppression regimen

Table 3: Transplant characteristics

Type of Transplant	N
Fresh parathyroid tissue	20
Cultured parathyroid cells with cryopreservation	135
Cultured parathyroid cells without cryopreservation	1
Cryopreserved parathyroid tissue	2
Microencapsulated parathyroid cells	3
Macroencapsulated parathyroid cells	1
Unknown	3

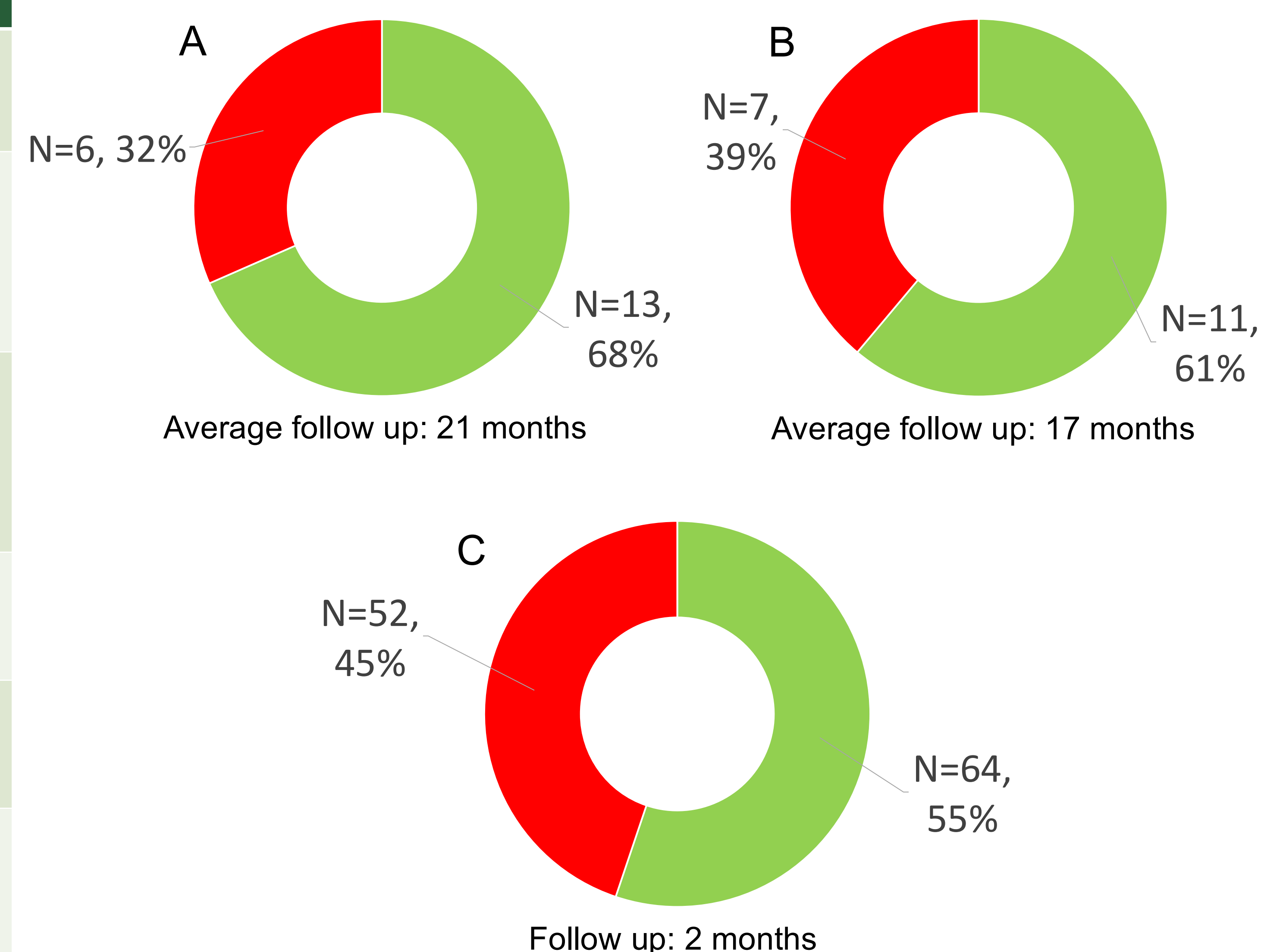


Figure 3: Success of allotransplantation of (A) fresh tissue with immunosuppression, (B) cryopreserved and cultured cells with immunosuppression, and (C) cryopreserved and cultured cells without immunosuppression (Nawrot et al. 2007)⁴

Discussion

Culturing of parathyroid cells is meant to retain the functional capacity of the cell without immunogenic material.⁴ Cryopreservation has been proposed to deplete cells of their HLA antigens, thereby rendering them as less immunogenic.⁴ However, our preliminary analysis suggests the necessity of an immunosuppression medication regimen regardless of cell culturing and cryopreservation.

References

- Bilezikian JP. Hypoparathyroidism. *J Clin Endocrinol Metab.* 2020 Jun 1;105(6):1722–36.
- Parameswaran R, Samuel M, Satish RL, Kripesh A, Moorthy V, Vajjhala R, et al. Parathyroid allotransplantation to treat post-thyroidectomy hypoparathyroidism: A review of case studies. *The Surgeon.* 2021 Jun;19(3):183–92.
- Miglietta F, Palmieri G, Giusti F, Donati S, Aurilia C, Iantomasi T, et al. Hypoparathyroidism: State of the Art on Cell and Tissue Therapies. *Int J Mol Sci.* 2021 Sep 24;22(19):10272.
- Nawrot I, Wozniak B, Toloczko T, Sawicki A, Gorski A, Chudzinski W, et al. Allotransplantation of cultured parathyroid progenitor cells without immunosuppression: Clinical results. *Transplantation.* 2007;83(6):734–40.