50 Years Ago in CORR

Acrylic Hip Endoprostheses

Dana M. Street MD CORR 1955;6:72–85

The replacement of diseased and injured joints has developed into one of the most successful surgical procedures ever developed to durably relieve pain and restore function. According to Street [10], “The desire to replace a diseased or a worn-out joint by a mechanically

perfect indestructible artificial one always has been present on the part of both doctor and patient.” However, it took well over half a century from the first attempts to achieve the goal of reliable pain relief and restoration of function. The first attempts were arguably by Gluck in 1891 [3] and inde-

pendently by Péan in 1894 [7, 9] and 1897 [8]. Gluck attempted to replace the ankle, knee, wrist, and hip, and experimented with bone cements, but all his operations failed from infection [2]. Péan devised several types of shoulder arthroplasties, including one replacing both sides of the joint. Until Charnley

Fig. 1 Type 1 prosthesis: acrylic head with shallow recess, hub at base of steel trifin nail. (Reprinted with permission and © Lippincott Williams & Wilkins, from Street DM. Acrylic hip endoprostheses. *Clin Orthop Relat Res.* 1955;6:72–85.)

Fig. 2 Type 2: similar head to Type 1, 3 small supplementary trifin nails placed to come within cortex of neck; nails are Vitallium. (Reprinted with permission and © Lippincott Williams & Wilkins, from Street DM. Acrylic hip endoprostheses. *Clin Orthop Relat Res.* 1955;6:72–85.)

Fig. 3 Type 3: acrylic head and neck, taper without abutment to allow settling to stable position; steel diamond-shaped nail. (Reprinted with permission and © Lippincott Williams & Wilkins, from Street DM. Acrylic hip endoprostheses. *Clin Orthop Relat Res.* 1955;6:72–85.)

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Table 2. Results

Prosthesis type	Fate of prosthesis				Range of motion			Pain			Ambulation support		
	Unstable	Infec.	Broken	Removed	Incr.	Decr.	Unchg.	Incr.	Decr.	Unchg.	Crutch	Cane	None
1	8	4	0	6	9	1	2	0	8	4	4	3	5
2	1	1	4	5	18	3	5	0	24*	2	6	6	12
3	0	0	0	0	7	2	1	0	7	2	3	1	5
Total	9	5	4	11	34	6	8	0	40	8	13	11	22

* In cases of breakage, symptoms just prior are reported.

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introduced the modern artificial hip dependent upon cementing the device in bone in 1961 [1], most attempts at best modestly achieved the goals. In the early 1950 s, Moore [6] and the Judet brothers [4] introduced the first prostheses that achieved widespread use, both in hips. These two implants were of distinct designs in that the former was all metal with an uncemented femoral stem while the latter was acrylic with a short stem extending only into the femoral neck. Both replaced only the femoral head.

Street introduced an acrylic and metal prosthesis of his own design in 1955. “When the work of Judet first appeared in the literature, we adopted a policy of waiting to see what the long-term results would be and resisted the temptation successfully for about 2 years to try this method” [10]. Since he had ready availability of a machine shop, he varied the design according to the condition, and some of his implants

had short stems (“Types I and 2,” Figs. 1 and 2) while others had long stems (“Type 3,” Fig. 3). By 1955, he had operated on 50 patients with these various devices and with a minimum followup of 4 months. The Type 3 was the most durable in this short term study (Table 2) and these patients were clearly improved compared to their pre-operative condition. Street commented, “The ideal prosthesis (1) causes no tissue reaction, (2) restores the normal mechanics, (3) is stable, (4) conserves maximum of normal bone or ligamentous tissue and (5) will not, a, break or, b, wear” [10].

Street’s perspective reflects his time. If the concept and importance of long term followup had been emphasized by Codman in the early part of the 20th century [5], it had not become widespread and clearly, Street’s implied concept of long term would have been considerably shorter than the 10–20 years or more we consider

today as standard for joint arthroplasty. Although Street’s criteria for an ideal prosthesis would be included among today’s criteria, Street mentioned no criteria related to the patient. For the patient the important criteria are that a joint implant procedure reliably and durably relieve pain and restore function with a low risk of complications. In these days of “evidence-based medicine” we place emphasis on patient-centered outcome measurements. Street’s article and device let us know how far we have advanced. It is through the efforts of these pioneers we have made progress.

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