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SPECIALIST ORTHOPAEDIC SURGEON

PATIENT INFORMATION

Pyrocarbon Shoulder Hemiarthroplasty

What is it

A pyrocarbon hemiarthroplasty is a half shoulder replacement for shoulder arthritis. The worn ball at the top of the arm bone is replaced with a smooth ball made of pyrocarbon, a very hard form of carbon, on a stem that sits inside the arm bone. Unlike a total shoulder replacement, the socket (the glenoid) is left in place, and the new ball moves against your own socket.

It is mainly considered for younger, active people with arthritis, in whom a plastic socket might wear out or loosen during their lifetime. It is a newer option: the first results were published within the last ten years, and the longest follow-up so far is about ten years.

Why pyrocarbon

Half replacements have been used for many years with metal balls made of cobalt-chrome. Their main problem is that the hard metal gradually wears away the socket, which can become painful and lead to further surgery [1]. Pyrocarbon is very smooth and much less stiff than metal, with a stiffness close to that of bone. The idea is that it is gentler on the socket, so the socket wears less and the shoulder lasts longer [2].

Who it may suit

The best results have been reported in people whose socket is worn evenly, whose rotator cuff tendons are healthy, and whose arthritis followed earlier dislocations, or followed collapse of the ball from loss of its blood supply (avascular necrosis) [3][4]. Results have been poorer when the socket is badly worn at the back, when the tendon at the front of the shoulder (the subscapularis) is torn or weak, and when the new ball is larger than the patient's own [3][4].

A pyrocarbon half replacement is not suitable when the rotator cuff is badly torn; a reverse shoulder replacement is usually used instead.

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What the results show

Compared with a metal half replacement, pyrocarbon has done better in every published comparison. In the Australian joint registry, about 9% of pyrocarbon implants in people under 55 had needed further surgery by 6 years, against about 17% of metal half replacements [1].

On its own, the larger studies report that 94–97% of shoulders have not needed further surgery at 5 years, and about 89% at 10 years in the longest series [4][5]. Most patients have less pain and better movement, and many return to work and sport [4].

Compared with a total shoulder replacement, the rate of further surgery so far looks similar [6][7]. In two studies, people who had a total shoulder replacement had slightly better early function or slightly less pain, although most patients in both groups did well [7][8].

Downsides and risks

The general risks are those of any shoulder replacement, described on the total shoulder replacement page. The risks particular to a pyrocarbon half replacement are:

- **The socket can still wear.** Pyrocarbon reduces socket wear but does not prevent it. Some wear has been seen on X-ray in roughly a quarter to a half of shoulders within several years, and when it progresses it is the main cause of pain and further surgery [9][4].
- **Pain that does not settle fully.** Some people are left with ongoing aching without a clear cause. In one large study, about 1 in 6 shoulders had not improved as much as expected at 2 years, although few of them had needed further surgery [10].
- **The size has to be right.** If the new ball is even slightly too large, the socket wears faster and further surgery becomes much more likely [4].
- **Breakage.** Pyrocarbon is hard but brittle. Fracture of the implant is uncommon but has been reported, mainly with the resurfacing cap version [6].

If further surgery is needed, the stem can usually be left in place and the shoulder converted to a total or reverse shoulder replacement, because the socket has not been replaced [4].

How certain is the evidence

The results so far are encouraging but limited. There are no randomised trials, most studies follow patients for less than 6 years, and many come from the surgeons who helped develop the implants [11]. Most studies measure success by whether further surgery was needed, which can miss shoulders that remain painful but are not operated on again [10]. Longer-term results, and results from a wider range of hospitals, are still to come.

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Questions you may want to ask

- How worn is my socket, and is the wear even or mainly at the back?
- Are my rotator cuff tendons healthy?
- How would a half replacement compare with a total shoulder replacement for me?
- What would happen if the socket wore down in future?

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