

Current status of replacement of the temporomandibular joint in the United Kingdom

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Abstract

Total replacement of the temporomandibular joint (TMJ) has been done in the UK since 1987. The three currently available systems are the Christensen system, the TMJ Concepts system and the Lorenz (BMF) system. Data from surgeons who replace TMJ were collated up to May 2007. There were nine units (eight NHS, one private) offering replacement. The TMJ Concepts system is the most popular of the three systems. Units are treating between five and 12 patients each year with an estimated total annual workload of 60–65 patients. The current total costs range from £15 000 to £19 000 for bilateral replacement. The most worrying complication is infection, which may affect up to 2.6% of patients.

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Introduction

Total replacement of temporomandibular joints (TMJ) has been done in the UK since 1987, when the Kent VK II system became available. That system was not available after 1992 after the voluntary bankruptcy of Vitek Inc, but limited manufacture continued in Switzerland until 1996.

In 1992 surgeons in the UK began to use the Christensen system. At first this had an acrylic cap at the condylar head but later this became a metal–metal system. The TMJ Concepts system (formerly Techmedica) was introduced into the UK in 2000 and the Lorenz (now Biomet Microfixation, BMF) system in 2001. These three systems are shown in [Fig. 1](#).

The purpose of this paper was to review current practice and provision of service 20 years after total replacement of the TMJ began in the UK.

Methods

Data from surgeons who replaced TMJ in the UK were collated after meeting at the European TMJ Forum held at The Belfry, near Birmingham, in May 2007.

Indications

The most common reason for replacing the TMJ is to relieve pain and improve reduced function caused by arthritis (osteoarthritis, psoriatic, and rheumatoid arthritis, and ankylosing spondylitis). Total joint replacement has also been used to treat ankylosis of the TMJ. Other indications include damage to the joint by trauma, and a small amount of revision after complications that arise from earlier joint replacement. Guidelines for total joint replacement of the TMJ have been published by both the American and the British Associations of Oral and Maxillofacial Surgeons.^{1,2} [Table 1](#) shows combined diagnostic data from Birmingham and Nottingham for the period 2004–2006. Not all the diagnoses are mutually exclusive: for example, a bony ankylosis may have begun as arthritis in the TMJ.

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Fig. 1. The three systems for reconstruction of the temporomandibular joint currently available in the UK: Christensen (top); TMJ Concepts (bottom left); Lorenz (BMF) (bottom right).

Surgical approaches to the TMJ

The trend has been towards standardisation of approaches. Superiorly a preauricular approach using the Bramley-Al Kayat technique of incising into the outer layer of the temporalis fascia will attempt to protect the frontal branch of the facial nerve.³ Inferiorly an upper Risdon (high submandibular) approach will gain access to the lower part of the ramus of the mandible. In patients with ankylosis, the temporalis muscle can be incised down to bone and reflected, as described by Norman.⁴

Distribution of services

This is shown in Fig. 2. Some areas of the UK are a long way from centres able to provide total replacement of the TMJ,

Table 1
Diagnoses from Birmingham and Nottingham 2004–2006

Osteoarthritis	18
Rheumatoid arthritis	2
Psoriatic arthritis	3
Ankylosing spondylitis	1
Ankylosis	2
Revision following previous replacement of the temporomandibular joint	2
Trauma	3
Total	31

and some large centres had no local NHS service in 2007 (including London and the south coast).

Workload

This is given in Table 2. In the late 1980s total replacement of the TMJ was done only in Birmingham and Gloucester. Four units started in the 1990s, with further developments from 2000 onwards. The TMJ Concepts system is the most popular. Units treat between five and 12 patients/year.

The current estimated total annual workload for the UK is between 60 and 65 patients.

Costs and funding

Costs are given for a bilateral case. All the systems that we use are made in the USA and will be subject to variations in the exchange rate.

The Christensen system costs £15 000 for the standard stock version, and £17 879 for the custom-made version, both made from a chrome-cobalt-molybdenum alloy.

The TMJ Concepts system (custom-made) costs £7200. Patients who are allergic to chrome, cobalt, molybdenum, or nickel may have all-titanium condyles, in which case the cost increases to £8000.

The Lorenz (BMF) stock system costs £8254 whether standard alloy or all-titanium condyles are used.

UK Customs duty may have to be paid in addition to these costs.



Fig. 2. Distribution of centres offering reconstruction of the temporomandibular joint in the UK in 2007.

Table 2

Workloads of units doing total replacements of the temporomandibular joint in the UK

Centre	Year started	Total number of joints replaced to date	Current system in 2007	Patients/year 2007
Aberdeen	1996	33	Christensen	5
Birmingham	1988	90	TMJ Concepts (Techmedica)	10–11
Bradford	2000	30	Christensen	10–11
Bristol	1998	16	Christensen, then TMJ Concepts	2–6
Glasgow	1995	35	Lorenz (BMF) + custom TMJ if needed	5
Liverpool	1995	29	Christensen, then TMJ Concepts	5
London (previously in Gloucester)	1987	250	TMJ Concepts	10–12
Nottingham	2002	34	TMJ Concepts	5–10
Oxford	2006	7	TMJ Concepts	5
Total annual workload (patients)				60–65

Table 3

Adverse outcomes 1999–2006. (Table from Professor LG Mercuri and TMJ Concepts, and reproduced with permission. Presented at the New York University College of Dentistry, 25 August, 2007.)

Adverse outcome	Number	Percentage of devices supplied to end of 2006 (<i>n</i> = 3285)	Percentage of cases to end of 2006 (<i>n</i> = 2106)
Infection	44	1.34	2.09
Operative difficulties	23	0.73	1.14
Malocclusion/malposition/displaced	19	0.58	0.90
Pain, swelling, or irritation	19	0.58	0.90
Dislocation	14	0.43	0.66
Heterotopic bony/scarred tissue formation	11	0.33	0.52
Exploratory operation	8	0.24	0.38
Sensitivity to material	7	0.21	0.33
Fractured component	7	0.21	0.33
Fracture of bone screw	6	0.18	0.28
Dehiscence or perforation	6	0.18	0.28
Loosening of component	2	0.06	0.09
Mishandling	1	0.03	0.05
Totals	170	5.18	9.03

Currently surgeons report that their hospitals are charging in a range of £15 000 to £19 000 for the whole procedure, including the prostheses. For most patients it is necessary to request individual funding approval from the relevant funding authority (Primary Care Trust in England, Health Board in Scotland).

Results

The main operative complications are bleeding from branches of the maxillary artery or from the pterygoid venous plexus, and damage to the trigeminal and facial nerve branches that can lead to numbness of the lower lip and weakness of the forehead and the lower lip.

In 2003 we found that some patients were allergic to one or more of the metals in the chrome-cobalt-molybdenum alloy used in the Christensen system. We instituted routine skin-patch testing and the use of all-titanium condyles for allergic patients who reacted to any of these metals. So far this has avoided a repeat of the foreign-body giant cell reactions that we have reported.⁵

Immediate infection of components is rare but it is possible to develop an infection later, which is associated with the development of a colony of bacteria and substrate living on the surface of the joints. This is known as a biofilm infection. Biofilms can develop just as easily on metal as on polyethylene surfaces. Such infections are managed by removing the components and reinserting them after an interval. If the fossa contains plastic (high molecular weight polyethylene), it must be remade. All-metal components that have not been distorted during explantation can be resterilised and reused with new screws. A protocol for the management of the biofilm infections of TMJ prostheses has been described by Mercuri.⁶ Data about infection of TMJ Concepts prostheses and other complications are given in Table 3, and show that 2% of all patients and 1.34% of all prostheses were affected by infection. Data supplied by TMJ Implants Inc. for both

total and partial TMJ replacement prostheses in 246 patients (of whom 24% had total replacements) showed a 1.6% infection rate. Data for Lorenz (BMF) prostheses from 434 joints in 268 patients show that 2.6% of patients and 1.6% of joints became infected.

Discussion

Already those responsible for funding this type of surgery in the UK are tending to choose to send patients to a unit with an established record and reputation. This can make it difficult for new surgeons and units to become involved. It follows that there is a responsibility to audit and publish results. So far the only publication from the UK covered the period 1988–1997.⁷ We are at present commissioning an internet-based national database, which will be ready for use in 2008. This should allow us to produce long-term data about survival of prostheses. Mercuri et al.⁸ published 14-year follow-up data for the TMJ Concepts system. Our aim is to produce comparable data from the UK. Some of the early VK II devices that were implanted up to 20 years ago in the UK are still functioning well, but the number is small.

There is a need for training and education, both for existing surgeons and for surgeons in training. For the past three years a TMJ forum has convened in the Birmingham area under the auspices of a study group, the British Association of Temporomandibular Joint Surgeons. We have recently been joined by surgeons from Europe, and plan to convene this forum yearly. The group has also been asked to develop a TMJ surgery course at the Royal College of Surgeons for senior trainees and interested consultants, starting in 2009.

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The Department of Medical Illustration at University Hospital, Birmingham, produced Fig. 2.

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