

Rheumatoid hand surgery: is there a decline? A 22-year population-based study

Rajiv Gogna · Graham Cheung · Melanie Arundell ·
Chris Deighton · Tommy R. Lindau

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Abstract

Background Rheumatoid arthritis (RA) is the most common idiopathic inflammatory arthritis affecting 0.8 % of the population. It can cause significant hand and wrist damage and dysfunction. Recent advances in anti-rheumatic treatments have the potential to decrease the prevalence of hand deformities in patients with RA.

Our aim was to investigate whether there has been a decline over 22-years in the number of hand surgical procedures being undertaken for patients with RA and whether this correlates with the introduction of new anti-rheumatic therapies.

Methods We performed a retrospective, population-based (Derbyshire) study of all patients with RA who underwent hand surgery at the Pulvertaft Hand Centre from 1990 to 2012. Index procedures included (1) teno-synovectomy and soft tissue procedures, (2) wrist arthrodesis/arthroplasty and (3) finger arthrodesis.

Results A total of 297 procedures were performed in 153 Derbyshire patients with RA over the 22-year period, with mean age at surgery 59 years (range 24–88 years). The female to male ratio was 2.5:1. The overall trend showed a peak in

2004 and a subsequent decline thereafter. This coincides with an increasing tendency by local rheumatologists to introduce earlier and more intensive conventional disease-modifying drugs and biological therapies for more resistant disease.

Conclusions There has been a decline in the number of hand surgery procedures being performed on patients with RA during our 22-year population-based study. It indicates that medical treatments and strategies have been successful at preventing disease progression.

Keywords Rheumatoid arthritis · Hand · Wrist · DMARD · Biological

Introduction

Rheumatoid arthritis (RA) is the most common idiopathic inflammatory arthritis affecting 0.8 % of the population [20]. In the UK, it has an incidence of 54/100,000 per year for women and 25/100,000 per year for men [25]. The disease has a female predominance, affecting women two to four times more often [21]. It is estimated that up to 70 % of RA patients report hand and wrist dysfunction [6], resulting in significant disability and a reduction in workforce participation.

Rheumatoid arthritis is classically treated by combined medical and surgical modalities; however, over the past two decades, novel therapeutic options have revolutionised the medical management arm.

The aim of medical treatment is to eradicate inflammation, prevent damage to joints and soft tissues and preserve the structure of affected joints [16]. Disease-modifying anti-rheumatic drugs (DMARDs) provide long-lasting ongoing control and also have anti-inflammatory effects [4]. They are broadly classified into two groups: conventional DMARDs (eg. methotrexate) and newer biological therapies (e.g. anti-TNF drugs such as etanercept). Biologics are

R. Gogna (✉)
Department of Trauma and Orthopaedics, University Hospitals
Coventry and Warwickshire, Clifford Bridge Road, Coventry CV2
2DX, UK
e-mail: rajivgogna@hotmail.com

G. Cheung
Department of Trauma and Orthopaedics, Royal Liverpool Hospitals,
Prescot St, Liverpool, Merseyside L7 8XP, UK

M. Arundell · T. R. Lindau
The Pulvertaft Hand Centre, Royal Derby Hospital, Kings Treatment
Centre (KTC), Uttoxeter Road, Derby DE22 3NE, UK

C. Deighton
Department of Rheumatology, Royal Derby Hospital, Uttoxeter
Road, Derby DE22 3NE, UK

costly compared to conventional DMARDs; however, they can be very helpful when traditional therapies have failed to suppress inflammation [4, 9].

It is possible that the trend towards earlier and more intensive use of conventional DMARDs and the use of biological drugs in patients with resistant disease may have had a major impact on reducing the number of hand surgeries being performed on patients with RA [4]. Previous studies have shown a reduction in the rates of orthopaedic joint arthroplasty for rheumatoid patients [8, 11, 12, 18, 23] as well as a recent study that highlights the apparent decline of hand surgery for patients with RA [5].

Aims

The aim of this study was to establish a link between modern use of DMARDs including biological therapies and the apparent decline in rheumatoid hand surgery. Our questions were twofold:

1. Has there been a decline in rheumatoid hand surgery?
2. Have new medical therapies had an impact on the amount of rheumatoid hand surgery being performed?

Materials and Methods

We performed a retrospective case note review using the ‘Delta’ database at the Pulvertaft Hand Centre, Derby, UK. Data was collected from a cohort spanning 22 years (1990 to 2012). Table 1 shows the index procedures which were broadly classified and pooled into three groups: [1] teno-synovectomy and soft tissue procedures, [2] wrist

Table 1 Index procedures broadly classified and pooled into three groups

1) Teno-synovectomy and soft tissue procedures
synovectomy—wrist flexors
synovectomy—wrist extensors
synovectomy—finger flexors
tendon transfer
2) Wrist arthrodesis/arthroplasty
arthrodesis—total
arthrodesis—partial
arthroplasty—silastic and total wrist
3) Finger arthrodesis/arthroplasty
MCP joint replacement
DIP joint arthrodesis
PIP joint arthroplasty or arthrodesis

arthrodesis/arthroplasty and [3] finger arthrodesis/arthroplasty.

Case notes were reviewed, and those patients with a confirmed clinical diagnosis of rheumatoid arthritis (RA) were included in the study. RA was diagnosed based on medical records including clinical features, blood test results and histology specimens where appropriate.

Data collected included patient demographics, date of surgery and operative details. The data was then crosschecked using the health records sorter to ensure that no cases were missed and that all case notes had been reviewed. We also collected data on the number of patients with RA on biologic therapies year by year from the database available in the Department of Rheumatology, Derby, UK.

Exclusion Criteria

Only primary surgical procedures were included; revision surgeries were excluded. The study was population-based. Although our tertiary referral centre does receive many patients from other regions, we felt that outside of Derbyshire, we could not be certain how many patients had been seen in our centre or their own local hospital. To keep our population controlled, all non-Derbyshire postcodes were excluded.

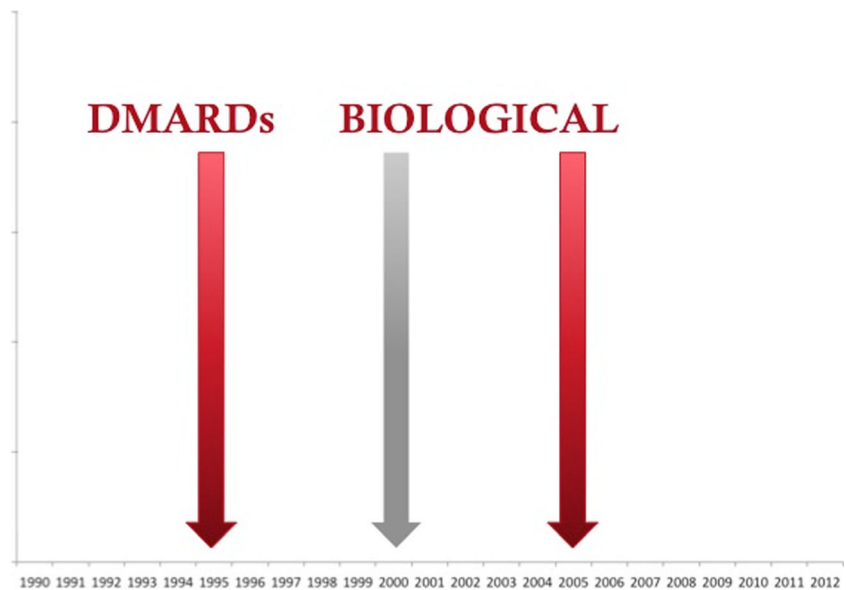
Patients having the previously listed operations for diagnoses other than RA were excluded from the study.

During this period, there was an independent study conducted within the department, the Swanson Metacarpophalangeal Joint Arthroplasty (SMPA) study (2004–2008) [3]. In this study, patients were given choice of medical versus surgical treatment. This cohort was excluded as this may have introduced a degree of bias.

Blinding

The rheumatology team were blinded to the surgical findings and asked to provide dates for when DMARDs and biological therapies were introduced and part of practice in our trust. Figure 1 shows that the consensus was that early and intensive DMARDs were much more common place by the mid-1990s, so 1995 was taken as a consensus date, and although biological therapies were introduced at the start of the millennium, the rheumatologists estimated that their true impact would not have been evident until 2005. The first patients who were introduced onto biological therapies had longstanding disease with accumulated damage and had failed on many conventional DMARDs. It was felt that it would be around 5 years for patients with a shorter duration disease and disease resistant to two or three DMARDs before being exposed to biological

Fig. 1 Graph highlighting when early and intensive DMARDs and biological therapies were introduced (*grey arrow*) and when their true impact might be observed (*red arrow*)



therapy. This consensus was agreed before the rheumatologists had seen the data on hand surgery.

Results

There were 637 index procedures in total, performed at our unit over the 22-year period. Of these, the following were excluded:

- Revision procedures ($n=28$)
- Non-Derbyshire procedures ($n=78$)
- Those involved in the SMPA study ($n=24$)

A total of 297 procedures were performed in 153 Derbyshire patients with RA, with mean age at surgery 59 years (range 24–88 years). The female to male ratio was 2.5:1.

The number of rheumatoid hand surgeries has evolved over the 22-year period for the three groups of index procedures (Fig. 2). There is a peak in the number of soft tissue procedures, which occurs before the peak in bony finger and wrist procedures. The index groups have all been combined into one graph and plotted against the number of consultant hand surgeons appointed at the Pulvertaft Hand Centre (Fig. 3). The graph shows a drop in all three index procedures after the 1995 introduction of DMARDs, but then a slow and steady rise in procedures until after the introduction of biologics. Since their implementation in the early 2000s, there has been a progressive decline. From the peak in 2004, there has been an 83 % reduction in hand surgery procedures for patients with RA. The number of consultant hand surgeons at our centre has been plotted to emphasise a decreasing trend despite departmental expansion and increased surgical service for the population.

Figure 4 shows the number of rheumatoid hand surgery cases per consultant during this period, emphasising that there has been a consistent decline over time.

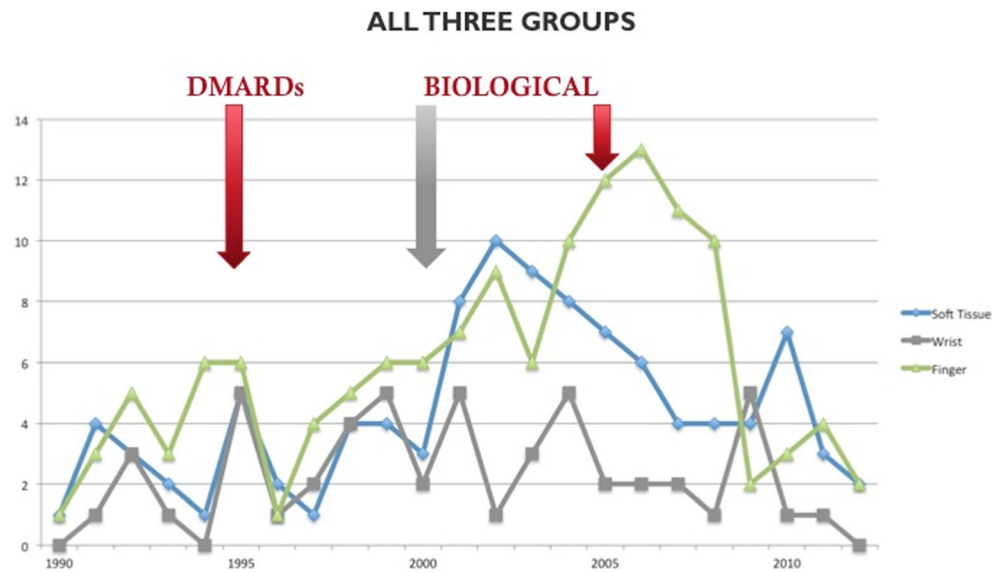
Data was also obtained on the number of new patients commencing biological therapies each year by the rheumatologists in our hospital (Table 2).

Discussion

It is widely accepted that early, intensive and combined DMARD and biological therapies have been successful at preventing disease progression and inducing remission in RA [9, 13, 19, 22]. Over time, there has been a steady decline in the severity of disease activity in the general population as measured by the DAS28 scoring system [26].

Our results are consistent with other recent reports looking at surgical trends in rheumatoid patients. Shourt et al. [17] reported a reduction in hand and wrist surgery for RA when comparing two separate cohorts (1980–1994 versus 1995–2007). However, the study pre-dates the widespread use of biologics and, hence, their results should be interpreted to be before the true effect of biologics has been seen. It should also be noted that their sample size includes only 80 hand/wrist patients and gives borderline statistical significance. As a result, we feel our study does add further value to this subject. A retrospective 13-year study from Swansea (UK) showed that between 1996 and 2009, there was a statistically significant decrease in the number of synovectomies, arthroplasties and arthrodeses performed on patients with rheumatoid arthritis of the hand and wrist [5]. The findings from our 22-year study are supportive of these results, highlighting that this is not merely a local trend. Our study also suggests that the introduction of biologics has a temporal association with a

Fig. 2 Graph plotting the three index surgical groups over the 22 years



reduction in hand surgery for RA, over and above the effect of DMARDs.

Excluding rheumatoid hand surgery, several studies have reported that rates of orthopaedic joint arthroplasty for RA have also declined over the last two decades following on from the shift to more intensive anti-rheumatic therapies [8, 11, 12, 18, 23].

Kievit et al. looked at rates of orthopaedic surgery for RA over a 20-year period (1989–2009) and noted a significantly lower incidence rate of surgery from 2006–2008 compared to all other previous years [11]. This correlates with our findings, as the downward trend appears to begin from 2005 onwards.

Louie and Ward analysed the changes in rates of joint surgery among patients with RA in California from 1983 to

2007 [12]. They included elective hip, knee, ankle and wrist arthroplasty or arthrodesis. The rates of joint surgery peaked in the 1990s and declined thereafter, suggesting that long-term outcomes of RA are improving. Their peak came earlier than the results of our study; however, this may reflect the fact that biological therapies have been used more frequently and for a longer period of time in the US compared to the UK.

Our results show that there was initially a progressive increase in the number of rheumatoid hand procedures from 1990 onwards. This could be explained by the evolution of our service—as our expanding department employed more consultants, there was a gradual increase in the number of surgeries being performed due to increased capacity and availability of surgical slots. Another explanation is that

Fig. 3 Combined surgical procedures for rheumatoid hand disease plotted against the number of consultant hand surgeons at the Pulvertaft Hand Centre

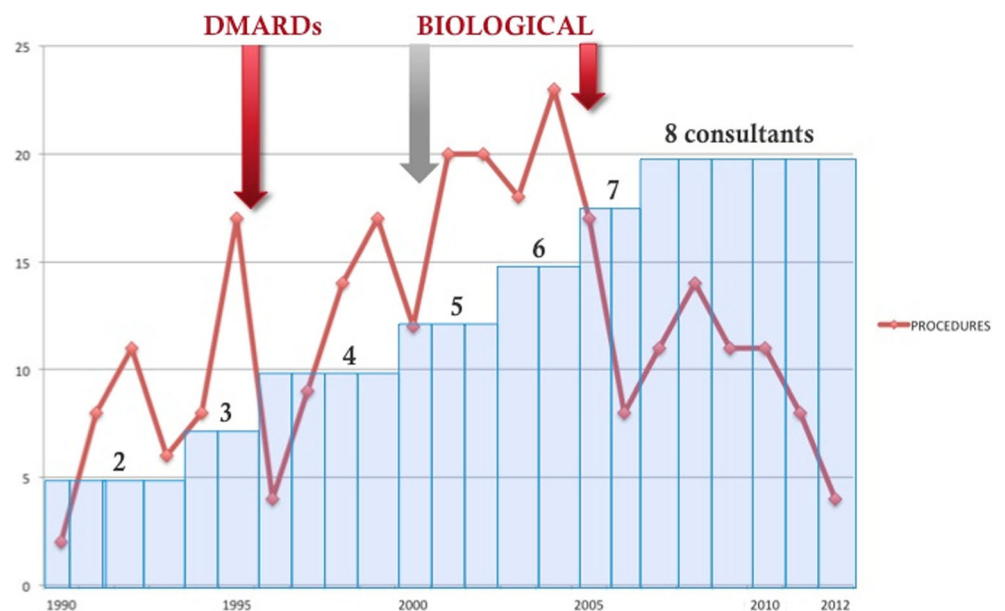
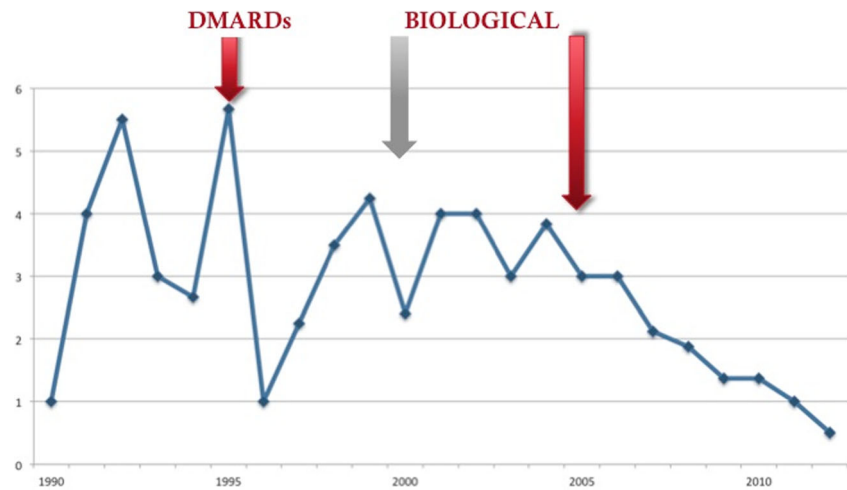


Fig. 4 Number of rheumatoid hand surgery cases per consultant over time



rheumatologists were less tolerant to synovitis during this period and were often referring patients to hand surgeons early on. A further explanation is that DMARDs alone were insufficient at controlling disease progression, and despite the initial drop in 1995, there was still disease breakthrough until combination therapy with biologics was introduced at the turn of the century.

From the early 2000s, we see a steady decline in the number of surgical procedures being performed for rheumatoid hand disease. There are several contributing factors for this decline, but the most significant impact has been due to the early introduction and intensive use of DMARDs and biological therapies. NICE guidelines now recommend aggressive early combination therapies for active RA to combat disease progression [21]. Soft tissue procedures, such as synovectomies were the first to fall, and that would also be consistent with the greater use of DMARDs and biologics. Table 2 shows that the number of rheumatoid patients commencing biological therapies has been gradually increasing

Table 2 Number of new patients commencing biological therapies each year

Year	Number of patients started on biological therapies
2001	3
2002	13
2003	34
2004	55
2005	48
2006	81
2007	81
2008	78
2009	104
2010	108
2011	90
2012	120

over time, and this correlates with a reduction in surgical interventions.

Over the last 22 years, rheumatological practice has also evolved; hence, the decline in hand surgery may not be attributed to biologics alone. Other important factors include campaigns to improve recognition of the disease, early referral to hospital rheumatology services by general practitioners and better screening methods available in outpatients. Inflammatory arthritis and joint destruction can now be screened for using more specific blood tests (eg. anti-cyclic citrullinated peptide antibody) as well as the widespread availability of ultrasound and MRI scans [14]. These factors together with combination drug therapies allow disease progression to be tightly monitored and controlled, reducing the effects of local and systemic inflammation which results in deformity and impaired function.

We do not have data on the number of new RA diagnoses per year for the same population or the number of RA patients seen during outpatient clinics. However, on a national scale, the number of new diagnoses has remained constant over the same period with a prevalence of 0.8 % and incidence of 54/100,000 per year for women and 25/100,000 per year for men [20, 25]. Hence, it is very unlikely that the decline in rheumatoid hand surgery is due to a reduction in new RA diagnoses.

The Pulvertaft Hand Centre is a specialist unit, and the local population prefer their treatment to remain there. This made it less likely that patients were simply moving their care to other local hospitals. To reduce that risk, we only included patients with a Derbyshire (DE) postcode. Wildin et al. showed that over a ten-year period (1990 to 2000), there was no change in the number of hand surgery referrals for RA to our unit; however, referrals for other conditions increased and there was a 34 % increase in hand surgery operations being performed over the decade [24]. This highlights that despite the increasing number of referrals received and continual expansion of our unit, rheumatoid hand surgery has declined.

Our findings show that the introductions of DMARDs and biologics have had a significant impact on our rheumatoid patients. More successful medical therapies have helped to control inflammation, resulting in fewer patients reaching deformities that require surgical intervention. We suspect that the effect of biological therapies may have had a more pronounced effect on soft tissue procedures, as figure B shows that this peak occurs a few years earlier than for bony procedures. It may be that the effect of biological therapies is only temporary and that bony procedures are simply being deferred; however, further long-term studies would need to be conducted for this to be established. Biological therapies may be delaying as oppose to completely stopping RA deformities, but if disease remission is sufficient, then surgical intervention may not be required during the lifetime of the majority of our patients.

We know that biological therapies are not without side effects. The risk of infection is roughly doubled in the first 6 months of commencement, but then no worse than the rest of the RA population [2, 7, 14]. The prevalence of skin cancer is also slightly higher, but there is no evidence linking biological therapies with any other malignancy [2, 10, 14]. Biological therapies are also very expensive; it is estimated that the annual cost of treating an RA patient increased threefold since their introduction [1, 15]. However, this must be weighed up against a compensatory increase in workforce participation, employment rates and a reduction of economic losses due to sick leave and permanent work disability [26]. We appreciate that the majority of rheumatoid patients around the world may not have access to expensive biological therapies and, therefore, hand surgery will always be a much needed treatment modality. However, funding and provision of resources for the medical management of RA in the UK and worldwide is beyond the scope of this paper and must be further analysed from a health economics and political viewpoint.

Our results also have a significant impact on hand surgeons and trainees, who have a reduced exposure to treating rheumatoid hand deformities. Given the expansion of hand surgery services, the number of rheumatoid cases per surgeon has drastically reduced (Fig. 4). However, there will continue to be cases where medical therapies are administered too late in the disease process or patients who are simply resistant to medications reaching irreversible damage and deformities.

We appreciate that our study does have some limitations, namely that it relates to a specific geographic group rather than a consistent population. However, this is a weakness of all epidemiological/population-based studies. Given that the number of cases for other procedures has continued to rise over the same time period and we have no reason to believe that patients with RA are seeking their treatment elsewhere, this association between falling rheumatoid hand surgery and the increased use of medical therapies is most likely real.

There is also the potential for missed cases due to incorrect coding. We performed several internal crosschecks to ensure that we had a complete data set; hence, we suspect there to be very few missed cases. We did not collect rheumatologic data on the outcome measures for our population, such as joint counts and other functional assessments. This may have been useful to evaluate the effectiveness of biological therapies in curbing progressive joint destructions but was beyond the scope of this paper. The positive effect of DMARDs and biological therapies has already been well established by previous studies.

Some of the patients that may have gone on to be included in the study were excluded between 2004 and 2008 [3]. In doing so, this reduced the number of patients available for the study. It should be noted that the decline in rheumatoid hand surgery procedures continues to occur even after the conclusion of the SMPA study. If the Derbyshire patients that went on to have surgery in the SMPA study were included in this review, the trend to a fall over the time would still be apparent.

Our study reinforces the link between the introduction of DMARDs and biological therapies and the decline of rheumatoid hand surgery. Since the introduction of medical therapies in the early 2000s, there has been an 83 % reduction in rheumatoid hand surgery. This indicates that medical treatments and strategies have been successful at preventing disease progression, which has a major impact on patients and surgeons.

Conflict of Interest Rajiv Gogna declares that he has no conflict of interest.

Graham Cheung declares that he has no conflict of interest.

Melanie Arundell declares that she has no conflict of interest.

Chris Deighton declares that he has no conflict of interest.

Tommy R. Lindau declares that he has no conflict of interest.

Statement of human and animal rights This article does not contain any experimental studies with human or animal subjects. Ethical approval was not required.

Informed consent Consent was not required for this study as there is no patient identifiable information included in this report.

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