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## EDITORIAL

# Tom Gibson, Plastic Surgeon (1915–93): Allograft rejection by the immune system and prediction of free tissue transplantation

### KEYWORDS

Plastic reconstructive surgery;  
Second set phenomenon;  
Microvascular tissue transplantation

**Summary** Tom Gibson made enormous contributions to the modern development of Plastic and Reconstructive Surgery. His key 1943 paper 'The fate of skin homografts in man' described the 'second set' phenomenon attributing graft rejection to an immunological phenomenon. Later in his career he visualised the concept of microvascular tissue transplantation and inspired many young surgeons through his various roles of Director of the unit at Canniesburn Hospital, Professor of Bioengineering and President of the Royal College of Physicians and Surgeons of Glasgow.

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On 7th November 2008, a bronze plaque of Tom Gibson was unveiled in the entrance of Glasgow Royal Infirmary taking its rightful place alongside those of Lord Lister and Sir William Macewen for his innovative contributions which we can now see as laying the foundations of modern reconstructive surgery. TG described the basis of homograft rejection and predicted free tissue transplantation, the understanding of which now presents the possibility of composite tissue allotransplantation (Figures 1 and 2).

In the early 1940s Tom Gibson,<sup>1</sup> working in the MRC Burns Unit at that hospital made the innovative observation that a second application of skin allograft pinch grafts was rejected more rapidly than the first and deduced that rejection was an immune mediated phenomenon. The key publication by Gibson and Medawar in 1943 describing the "Second Set" phenomenon laid the foundations for homograft transplantation of all tissues.

In later years, TG's various roles as Director of the Canniesburn Plastic Surgery Unit, paternal leader of the internationally renowned Canniesburn Course, President of the Royal College of Physicians and Surgeons of Glasgow,

and Professor of Bioengineering earned him an international reputation as leader and teacher.

The plaque was unveiled by Professor Sir Kenneth Calman, Chancellor of Glasgow University, and a former student of Gibson's, who emphasised TG's contributions to science, his intuitive handling of skin and his poetry.

Born in 1915, Tom Gibson was brought up in the Renfrewshire village of Kilbarchan (a blue plaque now marks this association<sup>2</sup>). He achieved the merit of Dux (best pupil) at Paisley Grammar School and he graduated at Glasgow University with commendation in 1938.

Gibson was appointed as Assistant Surgeon at the Western Infirmary in the "Septics' wards" where at that time burns were managed. He experimented with the skin grafting of burns using pinch autografts, the occasional homograft and skin flaps. The popular view at the time was that homograft rejection was due to infection.<sup>3</sup>

In 1942, an MRC Burns Unit was set up at Glasgow Royal Infirmary which had the busiest burns unit in the UK (in 1833 it had pioneered separate wards for burns patients).

Gibson began work in March 1942. Six weeks later, a two year old child was admitted with full thickness burns of the



Figure 1 Tom Gibson's plaque.

abdomen and right thigh. In treating this child he placed two sets of grafts from the father at an interval of 13 days. The first set showed extensive growth in all directions but the second grew little or not at all. By the 23rd day after the first set was applied, all the epithelium of both sets had disappeared. Gibson suggested that a reaction to the father's epithelium had eventually destroyed all the homograft tissue. He theorized that an antibody was responsible and called the reaction "the second set" (SS) phenomenon". These finds were confirmed in a second patient.<sup>4</sup>

While Gibson was carrying out these experiments, a non-clinical scientist, Peter Medawar was working on the same problem in Oxford. Educated at Magdalen College, Oxford where he read zoology, Medawar spent three years in the Sir William Dunn School of Pathology with Howard Florey (1898–1968). He became interested in the burns suffered by aircrew. Medawar felt that practical experience in a burns unit would, as he put it, "improve my mind out of all recognition". Arriving on 1 July 1942, he joined Tom Gibson and together they worked on a patient "Mrs McK" who had epilepsy and had burned herself badly when she fell against her fire. They grafted homografts and autografts and, subsequently, a second set of homografts. In his biography Medawar described what happened:

*My admirable colleague Tom Gibson already had a shrewd suspicion based upon previous clinical impressions that a second set of homografts would not*



Figure 2 The unveiling of Tom Gibson's plaque. Professor Gus McGrouther, Professor William Henry Reid, Mr David Soutar (left to right).

*survive as long as the first set and our histological monitoring, showed how right he was, for whereas homografts of the first set had enjoyed a period of grace in which they looked very much like grafts taken from the patient herself, the second set homografts seemed to be set upon and destroyed right away, to the accompaniment of a specially prompt inflammatory process and by a general impairment of the healing process accompanied by the penetration of the graft by the blood vessels. This was clearly an important observation, and when my period of secondment in Glasgow was over and I returned to Oxford, we resolved to publish our results without delay.<sup>5</sup>*

Gibson and Medawar published a report on the case in the *Journal of Anatomy* in 1943 in a paper entitled "The fate of Skin Homografts in Man",<sup>4</sup> a publication that has been described as "setting the science of tissue and organ transplantation on a scientific footing." Credit for the original observation must go to Gibson. As the *Journal of Anatomy* article notes, "One of us (TG) had recorded similar anomalous behaviour on the part of second set homografts in two earlier cases and had framed the hypothesis which follows in the discussion to account for it". In the article the hypothesis is stated in the following terms:

*The absence of a demonstrable cellular mechanism, the time relations of the process as a whole, and the accelerated regression of the 2nd set homografts combine to suggest that the breakdown of foreign skin epithelium is brought about by a mechanism conforming to the general pattern of antigen–antibody reaction.*

Medawar continued his research in the immune responses and was awarded a Nobel Prize in 1960.

Strangely, the first MRC report from the Glasgow Burns Unit covering the period 1942–43 and published in 1945 made no mention of this historic discovery although it established the principles of the management of the shock phase of burns.<sup>6</sup>

In 1944, Gibson was called up into the Royal Army Medical Corps. He practised as a surgical specialist in the Northern European war theatre and subsequently in India. On his return from the Army in 1947, he joined the newly formed plastic surgery unit based at Ballochmyle Hospital in Ayrshire, under J S Tough (1907–77).

In 1963 Gibson was appointed Senior Lecturer in Tissue transplantation in Sir Charles Illingworth's unit at the Western Infirmary in Glasgow.

About this time, the Bioengineering Unit at the new University of Strathclyde was opened and Gibson and his colleagues formed a fruitful partnership with Professor R M Kenedi (1921–1998), which continued after Gibson's retirement in 1980. Fundamental work was undertaken on the mechanics and ultrastructure of skin, cartilage and collagen. Gibson was awarded a DSc by the University as a consequence of his work, and in later years he was elected FRSE (Fellow of the Royal Society of Edinburgh).

In 1967, plastic surgery in the west of Scotland was centralized at Canniesburn Hospital in north-west Glasgow. This new hospital proved of immense value as a focus of training and research. Gibson succeeded as Director in

1970. His contacts, made during conferences and scientific meetings overseas, led to an ever increasing number of trainees from many countries coming to work at Canniesburn. Australasian and American fellowships and other international posts attracted outstanding young trainees who have gone on to become world leaders in the specialty. An innovation, begun in 1973 at TG's instigation, was the establishment of intensive week-long courses covering the entire spectrum of Plastic Surgery with key International Lecturers and participants from every continent. In a slightly different form, Glasgow's plastic surgery courses continue to this day.

At Canniesburn surgical innovation was vital. Harry Buncke who performed the first digital replantation in a monkey<sup>7</sup> attributed this concept to Gibson, stating "if I had not been to Glasgow, I would just be an ordinary Plastic Surgeon" There was a sense of excitement, a 'buzz', about new techniques – free flaps, muscle flaps, fascial flaps were introduced one after another by visitors or course participants. PG Arnold brought muscle flaps, Edgar Biemer the Chinese Flap, Journals were opened avidly to find the next new flap. Canniesburn was then a 'Camelot' of Plastic Surgery with Tom Gibson providing overall quiet encouragement to innovate surrounded by his knights of the round table: McGregor, Mustarde, Reid, Jackson and Senior Registrars Webster and Acland. Gibson's own contributions to technical innovation include the Gibson- Ross knife<sup>8</sup> for defatting avulsed degloved flaps, then common in Glasgow due to a potent combination of busses, jaywalking and alcohol. The 'Fillet of Sole' flap was another, and in the spirit of translation of his basic science studies, the correct way to carve ear cartilage to prevent warping from 'locked tension'.<sup>9</sup>

He remained at Canniesburn until his retirement, when he was succeeded by Ian McGregor (1921–1998).

Another important strand of Gibson's professional activities was his involvement with the Royal College of Physicians and Surgeons of Glasgow as Honorary Librarian, Visitor (President-elect) and President from 1976 until 1978. Subsequently he became Honorary Curator of the College's Art Collection writing 'The Royal College of Physicians and Surgeons of Glasgow: a short history based on the portraits and other memorabilia'.<sup>10</sup>

He was also active in his specialist society, the British Association of Plastic Surgeons, holding the office of editor of the British Journal of Plastic Surgery for 10 years. Once in a moment of literary exasperation he advised that 'the best way to lose all your friends is to edit the journal', but he generally went to exceptional lengths to achieve grammatical perfection. When Neven Olivari delivered his seminal paper on the Latissimus Dorsi Flap<sup>11</sup> in fluent prose to a breathless Winter BAPS audience, his then rather more hesitant English language skills became apparent in questioning. In discussing this linguistic contrast over coffee, Gibson remarked jokingly; 'But he read my text!' (Incidentally Professor Olivari is now both fluent and eloquent) Gibson also served as President of the Association in 1970. He co-authored several books, wrote well over a hundred peer-reviewed articles and was a notable contributor to standard textbooks. A particular labour of love was the translation from an arcane Austrian dialect of the papers of Karl Langer, explaining the mechanical

behaviour of skin and what are now termed Langer's lines.<sup>12</sup>

His daughter Jane is emphatic that she and her siblings remember him as a kindly and modest man, a firm parent and a grandfather fascinated by his grandchildren. His interests outside medicine, apart from music, included woodwork and enchantment with orchids which he bred with great success. He was an Elder of the Church of Scotland for many years. He also wrote poetry and a collection entitled Poems and Versifications was published privately in 1986. His skills on the violin were a feature of his membership of the Paisley Burns Club, one of the oldest in the world, where he played at the Annual Supper on the entry of the haggis.

Described by his colleague Ian McGregor, as a man possessed of "an enquiring mind with an iconoclastic bent", Tom Gibson's clinical observations, subsequently built on by the work of Medawar and others, proved to be fundamental in the development of tissue transplantation. The debt owed by Medawar was recognised in a letter he wrote to Gibson on 27 October 1960 shortly after he was awarded the Nobel Prize. He states:

*I know that what lies behind it (in my case) is the work we started together in those old days at the Royal Infirmary and I do want you to know how clearly I understand my obligation to you for giving me my first insight into the real problem we were facing, and my first understanding of the nature of clinical research.*<sup>13</sup>

Asked just before retirement; 'What will be the greatest future development in Plastic Surgery?' Tom Gibson replied (before any technology was available) 'Breast Reconstruction'. Would that he were alive today.

The bronze plaque memorial initiated by his successor in Bioengineering, Professor William Henry Reid is a memorial not only to Gibson's achievements but to the lasting loyalty inspired by this kindly giant, in those fortunate enough to have known him.

## Acknowledgement

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