



## Tooth transplantation: a controversial story

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The transplantation of human teeth from one individual to another has been described as a theoretical possibility in texts from the earliest days right up until the ninth edition of a very well known textbook on dental surgery and pathology as recently as 1953.

It is a procedure that has always been surrounded by controversy; firstly on the moral and ethical front, secondly with regard to the contemporary state of knowledge of tissue repair, tissue regeneration and tissue rejection, and thirdly because of the possibility of bacterial cross-infection and the transmission of disease.

An example of fierce hostility to the procedure is provided by Rowlandson's cartoon of 1787 entitled "Transplantation of Teeth". Who was the dentist being caricatured? Was it Ruspini -- a very up-market dentist who practised in London at that time? (one was reminded of this cartoon by a recent television report about two young South American sisters who were abducted -- then were returned to their mother with their upper and lower eyelids carefully sutured together, the corneas having been removed for the lucrative implant market. I felt this anecdote aroused the same sort of shock and horror which Rowlandson had intended.)

It is not surprising that in the earliest days, when surgeons saw how successfully teeth could be replanted, they should have hoped for equal success when a tooth was *transplanted* from an animal or another human source.

The earliest detailed surgical text to include dental techniques was perhaps that by the Spanish moor, Abulcasis, around 1100. He does not mention transplantation but gives detailed methods for the successful replantation of dislodged teeth.

Ambrose Pare in 1562 or thereabouts not only describes replantation in detail but is the first author to mention transplantation, although he never carried it out himself. He relates the case of a noble lady who had a tooth taken out and immediately replaced by another supplied by one of her ladies in waiting. After a time she masticated with it as well as she had done with the former one.

Neither our own Maister Peter Lowe in 1597 nor the distinguished French surgeon Jacques Guillemeau in 1598 mentions transplantation. But Charles Allen in York, who produced the first dental textbook in the English language in 1685, regarded it as commonplace although he objected to it forcibly upon moral grounds. He claimed that it was inhumane, attended by difficulties, and was not a true restorative procedure since the repair of one dentition was at the expense of another.

Allen was much more in favour of transplanting teeth from animals and advocated choosing one whose teeth most closely resemble the one to be replaced -- he mentioned dogs, sheep, goats, and baboons. "Immobilise the animal and resect the required tooth with a little of the

surrounding gum," he instructed. "Remove the tooth from the patient's mouth with similar care . . . Fasten the animal tooth in place in the patient's mouth."

Pierre Fauchard, the founder of modern scientific dentistry, published his celebrated work, *'Le Chirurgien Dentiste'* in 1728. In it he gave an account of a case of transplantation. A Captain in the army with a decayed and aching left upper canine asked Fauchard if it would be possible to replace it with another person's tooth. Upon receiving an affirmative reply, the officer sent for a soldier of his company to whom he had already spoken. Fauchard found the donor canine to be too large; nevertheless, for want of a better he extracted it and after having diminished it in length and thickness, he transplanted it. This it was not possible to do without the central cavity of the tooth remaining open. In two weeks' time the tooth was firm and he filled it. The filling immediately caused such insupportable pain that he was obliged to remove it the following day; on which the pain ceased directly. Fauchard saw the patient eight years later and was assured by him that the transplanted tooth had lasted him six years, but that its crown had been gradually destroyed by caries. The root had been extracted by a dentist but not without considerable pain.

Philipp Pfaff in 1756 cautioned against the transmission of scurvy and venereal fluids. He emphasised the need to take care of the periodontal membrane of the transplanted tooth and advocated the sealing of the apical foramen with lead or wax "a very important advice in an evil affair". His dislike of the whole process was underscored by the remark that "he seldom uses human teeth because most people have a dread of teeth which have been obtained from a corpse."

Etienne Bourdet, the most significant French author after Fauchard, wrote in 1757 supporting transplantation. He suggested that because of the variations in size of the shape and roots of a tooth "one should make sure you have several donors, Savoyard boys or others, so that if the tooth of one does not fit, it can be put back in (replanted), so that the donor be not deprived of it, and several others can be tried". Savoyard boys seem to have been used exclusively in Paris at that time for transplantations on account of their poverty.

Meanwhile Michael Whitlock, the earliest provincial dental surgeon and based firmly in Norwich by 1762, was trumpeting his skills in transplantation.

Carl August Grabner in 1766 reports several cases of tooth transplantation, including a singer who had rewarded her serving maid with a bridal gown for having donated her tooth.

Thomas Berdmore, Surgeon-Dentist to His Majesty, made a significant literary contribution in 1768 in which he strictly rejected tooth transplantation.

Mrs De St. Raymond visited York in 1775 and offered "to transplant teeth from the front of the jaws of poor lads into the heads of any Lady or Gentleman without putting both patients to any anguish."

John Hunter published "A Practical Treatise upon Diseases of the Teeth" in 1778. He made many important observations upon clinical dental techniques based upon his insight into the detailed anatomy and physiology of the jaws and oral and dental tissues. His interpretation of his scientific knowledge led him to believe that transplantation of teeth should be possible and he advocated numerous practical measures which, in his opinion, would promote success. He tested his theories by practical experiment and was responsible for a great upsurge in demand for this method of treatment.

It must be remembered that Hunter and his contemporaries knew nothing of the homograft reaction and would therefore expect equal success in the case of a tooth replanted in the mouth from which it had come as with a tooth transplanted from the mouth of one individual to the mouth of another. Hunter is, however, guilty of not having appreciated the significance of symptoms of syphilis appearing in seven patients following tooth transplantation. Several of his contemporaries in this country and abroad advised (in the words of Joseph Bell) "great caution in carrying out transplantation since it has been proved by many examples that contagious maladies of a serious nature may easily be communicated in this way from one individual to another."

William Rae, a pupil of John Hunter, gave the first series of lectures upon dental surgery in 1782. On the subject of transplantation he insisted: "It must be a tooth with one root only, as we cannot find them with two or more roots to fit: this operation does not succeed once in five times, and though they fix for a little time, they generally act as extraneous bodies, and like pease in an issue keep up a continual discharge." Rae also said that it was "cruel to take the teeth of a poor creature, whose necessities may induce him to part with it as a means of procuring him subsistence." He warned that poor people were often diseased, "and generally with the lues venerea." Challenging Hunter's claim that "we cannot inoculate the venereal disease by the blood" he said that there were many instances to the contrary. He cited the case of a young lady from Southampton, who "came to town to have a tooth transplanted, and being very anxious to have a proper one got and perfectly free from any infection, the subject from whence the tooth was taken, was examined by some eminent surgeons, who pronounced it very safe: the operation was performed and she was soon affected with the venereal disease, which destroyed all that side of her face, and she very shortly died." Rae added that when there was no venereal disease there would always be local suppuration; he himself had been called to do many of the resulting extractions, and had found that sometimes the root was "absorbed and made like a honeycomb."

Meanwhile, in Edinburgh, John Rae, William's younger brother who in 1781 had been admitted the first Fellow of the Royal College of Surgeons, was advertising in the *Edinburgh Advertiser* of January 12, 1784 that "he continues to transplant teeth and to perform every other operation relative to natural teeth"

Benjamin Bell, Edinburgh's first scientific surgeon, also spoke of tooth transplants with enthusiasm in his "System of Surgery" in 1786 but criticised Hunter's disregard of the possibility of transmission of infection. He advised that "teeth should not be taken from donors who appear to be sick and that in every case the tooth to be transplanted should be immersed in luke-warm water before being cleared of blood or any matter that may adhere to it by rubbing it gently between the folds of a piece of soft, old linen."

D. Steuart, dentist at 22 Princes Street, Edinburgh, advertised in the *Edinburgh Evening Courant* of December 8, 1791 that he "fills decayed teeth and transplants real ones on the most moderate terms" and another Edinburgh dentist, Robert Spence, of James Court, advertises in the same newspaper on August 1, 1795 that he "continues to practise his profession in all its branches. Teeth Drawn, Transplanted, Cleaned, with perfect safety." >>

August Gottlieb Richter of Gottingen, writing in 1798, described tooth transplants without any ethical reservations and discusses the possibility of transmitting venereal disease with quotations from Hunter.

Johan Jacob Joseph Serre in 1803 expressed grave scruples about tooth transplantation because of the danger of transmitting syphilis: "Hunter believes that this disease can only be transmitted by pus. Is it not possible, however, that a drop of impure blood from the alien tooth ... could infect the entire mass?"

Frederick Hirsch in 1804 stated that even when the gum and alveolar bone were quite healthy in individuals entirely free from scurvy and syphilis and under 50 years of age; transplanted teeth did not take root perfectly except in one case in three. This controversy rumbled on for the next 150 years with succeeding authors repeating that transplantation of human teeth from one individual to another was possible but that the chances of success were poor, there was great danger of infection, and it was a thoroughly immoral procedure.

The reason why it continued was that there was a continually increasing demand for the replacement of damaged or missing teeth by aesthetically acceptable substitutes, though not only for transplantation but also for the production of partial or complete dentures.

In 1804 every dentist required a good stock of sound, non-carious human teeth. What were the possible sources? Teeth extracted by the dentist himself; teeth from the bodies of hung criminals which had been directed by the court to be used for dissection; from unclaimed bodies of paupers; from mortuaries or graveyards; from battlefields (hence 'Waterloo teeth'); and by purchase or reward from living donors.

There is a letter dated 1782 from the daughter of a London dentist to her brother in Paris. "Father asks you to do everything you can to get him some teeth, and if you can get into the mortuary you must take advantage of this opportunity," she writes. "If that is not possible, you must try to get to know the brother friar who is in charge and ask if some can be provided. You may have to pay for the incisors and laterals. Father used to pay 12 livres per hundred for the canines".

The shortage of the supply was also acute in New York in 1782 when Pierre Le Mayeur advertised that "any person disposed to part with their FRONT TEETH may receive Two Guineas for each Tooth, on applying to No. 28 Maiden Lane, New York."

On to this stage stepped Nicholas Dubois de Chemant with the discovery which he had patented in 1791 that teeth and dentures of a sufficiently natural appearance could be made from 'mineral paste' and hardened by firing in an oven. Such porcelain dentures were non-porous and inert as far as the fluids and bacteria in the mouth were concerned. The paste could be moulded to fit accurately a model made from an impression of the fitting surface. This was the first time that a 'plastic' material had been used instead of carving a fitting surface and would be followed by vulcanite and acrylic resin in later days.

There were many problems to be solved but De Chemant's discovery led to a major technical innovation – the individual porcelain tooth, introduced by da Fonzi in 1808. This discovery was not superseded until the introduction of plastic resin in 1940.

By 1840 porcelain teeth were being produced in huge numbers. Half a million were being exported annually from Paris alone. Their arrival coincided with great increases in the numbers of dental technicians and dentists. This major advance in technique played a large part in the growth of demand for dental treatment in the first half of the nineteenth century and thus in the number of dental practitioners. It also signalled the end of the distasteful practice of recycling human teeth from the mouth of one individual to that of another.

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