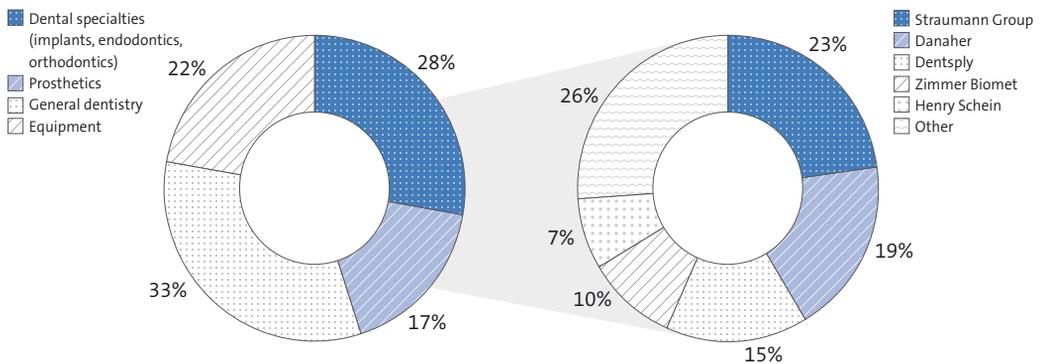


Markets

Leadership strengthened in a CHF 7 billion market

THE CHF 24BN GLOBAL DENTAL MARKET BY CATEGORY AND IMPLANT SEGMENT SHARE



Consolidated figures for Straumann (incl. Neodent), Danaher (incl. Nobel Biocare, Implant Direct and Alpha-Bio Tec.), Dentsply Sirona (incl. Dentsply, AstraTech and MIS) and Henry Schein (incl. Camlog and BioHorizons). The global market for implant dentistry (chart on the right) is worth CHF 3.5 billion.

THE GLOBAL DENTAL MARKET BY CATEGORY

The global market for dentistry is an attractive segment of the medical device sector with annual sales of approximately CHF 24 billion¹. Typically it grows 1.5 to 2 times faster than global GDP, driven by increasing oral health awareness and an aging population. In the past decade, studies have linked missing or poor dentition with significant nutritional changes, increased risk of diabetes, stimulation of coronary artery disease, and higher probability of some forms of cancer.^{2,3}

The implant and abutment segment, where Straumann generates most of its revenues, accounts for nearly 15% of the overall dentistry market and is part of the dental specialties segment (see chart above). Independent research indicates that this segment will continue to grow faster than general dentistry and offers an attractive

return on invested capital, particularly to those companies that serve a large share of the market.

Market size and growth have to be estimated using internal intelligence and independent research because very few companies in these markets publish sales and other relevant performance information.

In recent years, Straumann has entered new fast-growing markets organically and with partners, which has provided new insights. We have also broadened the geographical and segmental scope of our market intelligence efforts and currently believe that the global market for implant dentistry is worth CHF 3.5 billion⁴, including implant fixtures, abutments and related instruments.

In 2016, the world market continued to grow at 3–4%, bringing the estimated total number of implants placed to approximately 18 million. Growth was higher in volume than in monetary terms, reflecting strong growth in emerging markets (where average prices are lower), the increased share of non-premium products, and modest price deflation in general.

Geographically, Europe remains the strongest region and, together with North America, accounts for approximately three quarters of the global market value. Asia continues to be a growth engine, increasing twice as fast as the next fastest region, North America. The implant market in Europe grew modestly and showed mixed dynamics in national markets. While traditional markets like Italy, Switzerland or the Netherlands fell short of the previous year's level, demand in other key markets like Iberia, France, the UK, and Scandinavia increased. The development was bolstered by high growth markets in Eastern Europe, except for Russia, which is still suffering from the economic crisis. Latin America grew modestly despite a stagnating Brazilian implant market.

The implant market can be divided into two segments: premium and non-premium. Premium companies are distinguished by their pre-clinical research and development activities; pre- and post-market clinical documentation; degree of product innovation and breadth; as well as added-value customer service including training and education. The Straumann Group leads the global implant market. Under its premium brand, Straumann, it offers a wide range of implants priced at multiple levels, depending on the material and surface technology. The Group also competes in the non-premium segment through its Instrandent platform and its associated partners.

By consistently outperforming the market average in recent years, the Group has strengthened its leadership position and commands an estimated market share of 23%.

By value, about 70% of the market is controlled by the leading five companies. The remaining 30% is distributed among several hundred non-premium manufacturers, who compete mainly on price, offering only limited research, training and education services. However, in several developing countries where overall treatment

costs are low (namely Brazil, Russia, Israel and South Korea), non-premium manufacturers hold substantial combined market shares. Even though the growth differential between the two segments is diminishing, the non-premium end of the market continued to grow faster in 2016.

Straumann entered the fast-growing non-premium segment in 2012 through a partnership with Neodent, and the Group's value platform has continued to expand since then. Our strategy is to offer an attractively priced portfolio in all relevant markets through Instrandent without compromising the premium leadership of our legacy brand. Instrandent comprises well-respected brands and uses a different distribution model to match specific market needs and affordability.

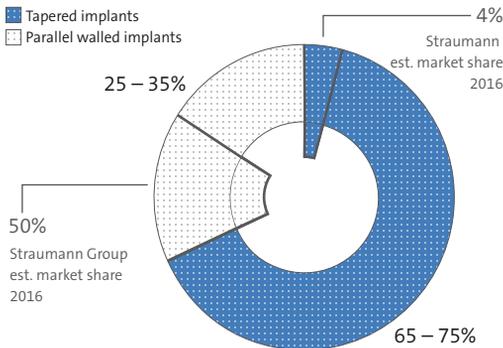
The attractiveness of the industry continued to stimulate the appetite of strategic buyers and private equity firms in 2016 and several companies took advantage of the historically low interest rates to make acquisitions. The largest transaction (USD 5.5 billion⁵) was the stock-for-stock merger between the Dentsply International and Sirona Dental Systems in February 2016, creating a dental conglomerate with annual revenues of USD 3.8 billion⁶. Dentsply also acquired the Israeli non-premium implant company MIS Implants Technologies for USD 375 million. In 2016, the Straumann Group acquired a 30% stake in the French implant manufacturer Anthogyr. Finally, the Carlyle Group, one of the world's leading private equity companies, acquired a majority stake in the German company exocad, a provider of innovative dental laboratory CAD/CAM software. In 2011, Carlyle invested in 'mydentist', a large dental chain in the UK with 450 practices focusing on National Health Service dentistry.

THE TAPERED IMPLANT SEGMENT OFFERS HIGH POTENTIAL

Dental implants are distinguished by their thread and body design. Tapered implants offer high primary stability, while parallel-walled implants are versatile and have been documented for 30 years. More than two thirds of the implants sold in 2016 were tapered.

Over the years, Straumann and the ITI have been strong proponents of parallel-walled implants and Straumann controls roughly half of this segment (see chart opposite). Contrastingly, our Neodent brand has offered

IMPLANT CATEGORIES AND THE STRAUMANN GROUP'S VOLUME SHARE OF EACH



tapered implants for many years. In 2015, Straumann entered the tapered segment with its premium BLT implant which had gained a (volume) market share of slightly more than 4% by end of 2016. We aim to increase this in the coming years through targeted marketing initiatives and further product line extensions.

IMPLANT PENETRATION LEVEL STILL LOW

The principal factors driving growth in the tooth replacement market are increases in:

- The number of older people,
- The middle class in developing countries,
- The use of implants,
- Patient awareness, and
- People choosing cosmetic surgeries and implants.

Over the past decade, the proportion of elderly people in developed countries has increased every year. The percentage of the US population over the age of 60 has more than tripled and now amounts to 14%.⁷ This is expected to rise to 22% by 2020.

More than 35 million Americans are fully edentulous.⁸ This is expected to continue rising as the baby boomer population ages. Older patients are far more likely to require tooth replacement or be partially or fully edentulous than the younger generations. The American College of Prosthodontists estimates that the number of partially edentulous patients will continue to increase in the next 15 years to more than 200 million.⁸ 90% of edentulous people use simple, unanchored dentures. Some may not see a need for improvement in their

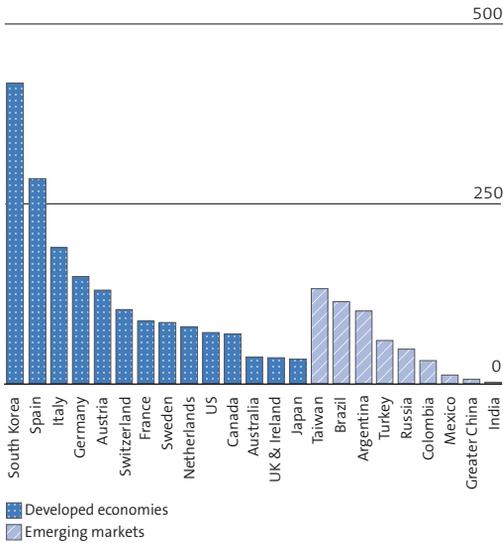
chewing function and have accepted the limitations of their gum-supported dentures. Others cannot afford implant procedures and seek low-end permanent restoration solutions (WHO estimates more than 60% fall in this category). Still others want to upgrade to implant-supported fixed or removable overdentures. To serve this market, Straumann offers its customers various premium solutions including Pro Arch (see p. 35 f.) and Novaloc.

While the absolute number of edentulous people is rising, epidemiological data indicate that the rate of toothlessness in the US⁹ and Germany¹⁰ is decreasing as preventive measures to reduce tooth decay and periodontal diseases become effective. Today, one in eight people in Germany aged 65–74 is edentulous, in contrast to one in four 20 years ago. Nevertheless, despite improvements in highly developed countries, edentulism is still increasing in emerging markets.¹¹ Consequently, patients in countries with better oral health will require more single- and multiple-tooth restorations than full dentures. In emerging markets, simpler surgical protocols that reduce technical barriers for dentists and can be performed at lower cost will be required to serve a larger pool of patients.

The pool of potential implant patients seems inexhaustible. In the developed world more than 600 million people are affected by tooth loss, but each year fewer than 60 million seek treatment¹². It is striking to see that 178 million people in the US are missing at least one tooth, yet only a million are treated per year (corresponding to 2.3 million implants). This level is low in absolute terms and in comparison with other countries.

In 2016, the 5th edition of the widely recognised German oral health study ('Deutsche Mundgesundheitsstudie V') was published. It is limited to Germany, but is probably the most systematic and comprehensive study in the industry and provides interesting information on the trends and prevalence of modern tooth replacement. The study revealed that roughly 10 times more patients have implant-supported crowns or bridges compared with 1997, which supports the prevailing trend of increased fixed tooth replacement. Yet, despite the positive trend, implant prevalence is still modest. Only 3% (2005: 1%) of young German adults (35–44 years old) have one or more implants, while 8% of people aged between 65 and 74 years (2005: 3%) have implant-borne

DENTAL IMPLANT PENETRATION BY COUNTRY (PER 10 000 POPULATION)



With very few exceptions, tooth replacement is an out-of-pocket expense. In South Korea, reimbursement was gradually introduced for senior citizens in 2014. This, together with the fact that over 70% of the dentists in the country place implants, explains the high penetration rate. By contrast, large economies like China and India remain heavily underpenetrated due to a lack of qualified dental professionals.

prosthetics. Further evidence of a positive trend is that the implant penetration among younger adults with high social status reaches 20%, although only 2% of the German population aged between 65–74 have received implant-borne solutions to replace missing teeth.

As the chart above shows, the number of implants placed per 10 000 population in the US is only half that in the largest European market, Germany, which illustrates the considerable growth potential. Other highly populated countries like the UK and Japan also show strong upside potential.

It is well established that the primary causes of tooth loss are decay and injury, but periodontal disease, cancer, simple wear, or anodontia (absence of permanent teeth) can also create a need for tooth replacement.

Despite the fact that statistics show positive effects of enhanced oral hygiene and preventive measures, the

increased substitution of implants for conventional dentures, bridges and crowns is the main driver for growth in the dental implant market. Manufacturers are therefore seeking to unlock potential by raising awareness of the advantages and long-term clinical benefits of implant solutions among patients and dentists.

Despite the fact that implant-supported tooth replacement has become an accepted, well established treatment in all developed markets, only 15–20% of the 1.2 million world's active dentists are surgically active.¹³ Dentists with a post-graduate degree (e.g. periodontists, oral and cranio-maxillofacial surgeons) place a high number of implants and get referrals from less-trained general dentists.

The referral concept is still common in many countries because most dental schools do not offer hands-on implant courses in their undergraduate programs, and implant-based procedures require experience.

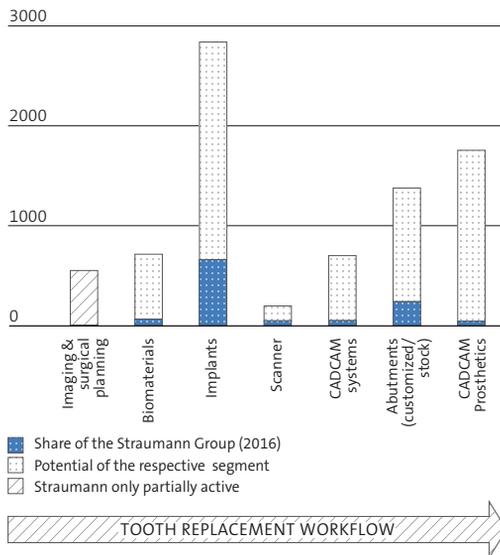
Practitioners are slowly becoming comfortable with the surgical procedure. Research data show that a typical US dental practice restores 220–330 teeth per year, but places only 20 implants.¹⁴ In contrast, specialists place several hundred implants per year. Straumann therefore has several initiatives to increase adoption and to reduce the entry barriers for younger dentists (see pp. 86 ff., 98).

Our penetration analysis indicates that 15–20% of US adults who are medically eligible and seek treatment for tooth loss actually receive implants.¹⁵ In Germany, the penetration level is approximately 20%, and in Switzerland, our internal surveys indicate that it is close to 40%.

Cost is an obstacle. In a few cases, the public healthcare system reimburses part of a dental implant procedure. Private insurance schemes on the other hand are either financially unattractive or apply strict entry criteria. Even in cases where insurance companies do cover dental implant procedures, the amount reimbursed is often insufficient to cover the full cost of treatment, leading to considerable out-of-pocket costs for patients, who are discouraged from choosing the procedures.

Market research shows that some patients seek metal-free implant solutions, which is why Straumann

STRAUMANN'S ADDRESSABLE MARKET
(WORTH CHF 7BN)
(in CHF million)



developed its all-ceramic PURE implant. Although this type of implant currently represents less than 1% of the global implant volumes, demand is expected to grow significantly in coming years.

BECOMING A FULL SOLUTION PROVIDER – ADDRESSING A CHF 7 BILLION MARKET

Besides its implant business, the Straumann Group is also active in the prosthetic and regenerative dentistry market, which includes both consumables and equipment. Restoration and regeneration are strongly connected with implant procedures and offer the Group considerable cross-selling potential (see chart above). Straumann has increasingly focused on these fields in recent years. By doing so, the Group has increased its addressable market and is now active in dental segments that are collectively worth approximately CHF 7 billion (see chart above).

Thanks to investments in Dental Wings, Valoc and Medentika, as well as partnerships with Amann Girrbach, botiss and others (for a complete overview please refer to page 25), the company is able to offer its customers a complete range of biomaterials as well as a comprehensive range of CAD/CAM tools and services.

THE DENTAL PROSTHETICS MARKET

Tooth restorations (e.g. crowns, inlays, onlays, bars and bridges) are made increasingly by automated processes rather than by hand. Digitalization now makes it possible to design and make prosthetic elements by Computer-Aided Design and Manufacturing (CAD/CAM), saving time and increasing accuracy. Straumann's products in this area help dental practitioners to complete a dental tooth replacement procedure more efficiently with digital tools.

Digital dentistry – from CT/DVT imaging and intra-oral impression taking in the practice to automated output in the laboratory – is still at an early stage, although less so for laboratories than for dentists. As the technology advances, more dentists and laboratories will recognize the benefits and value of investing in CAD/CAM technology and will offer them to their patients.

CAD/CAM makes it possible to use strong, translucent glass-ceramic materials such as Straumann nIce and zirconia, which look natural and are fracture-resistant. Internal and independent surveys have shown that patients are increasingly willing to invest in treatments that not only restore function, but which also improve appearance.

The sale of CAD/CAM-produced prosthetic elements is the largest part of this market segment. In 2016, we estimate that one in three prosthetic elements (tooth- and implant-borne) was made by CAD/CAM. This is expected to increase. Market research¹⁶ indicates that general dentists usually obtain CAD/CAM manufactured crowns and bridges from local labs. About two thirds use models or impressions to order the restorations. In an internal US labs survey, labs reported that they receive fewer than 1 in 10 impressions from the dentist in digital form. In the next few years, general practitioners anticipate that most CAD/CAM restorations will be outsourced but that digital scans will increasingly replace physical models.

CAD/CAM EQUIPMENT

Different CAD/CAM sites deploy different equipment:

- In chairside systems scanning, design and milling are all performed in the dental practice. The milling machine is small.
- Full in-lab systems offer scanning, design and manufacture on medium-sized milling machines.

- In central milling, in-lab scanners are connected to an offsite milling center that uses sophisticated, heavy milling machines.

Currently, penetration of complete chairside milling systems remains low. Only an estimated 15–20% of dental practices in developed markets like the US, Germany or Switzerland have made the investment¹⁶, underscoring the value proposition and market opportunity the technology holds.

In contrast to the slow adoption of chairside scanning and milling systems, dental labs have invested in CAD/CAM technology. 60% of the dental labs surveyed have an in-lab scanner and 40% have also invested in a milling system. Of the larger labs, 85% have a scanner, milling system, and sintering furnace, and a significant proportion intends to invest in additional CAD/CAM equipment.¹⁷ While small labs are eager to adopt automated workflows, the high cost means that few own CAD/CAM milling equipment.

In-lab scanning with centralized milling is an attractive solution because it offers labs access to the latest technology without investing in expensive, high-maintenance milling equipment. The etkon ‘Scan & Shape’ service offers scanning and milling to labs that do not have their own scanning capability. This service benefits smaller and medium-sized labs when complex restorations need to be milled. Through its collaboration with Amann Girrbach, the Group gained an initial foothold in the in-lab milling segment at the end of 2015. In 2017, Straumann will also begin to offer chairside systems. Lack of reliable market data makes it difficult to quantify market shares in CAD/CAM prosthetics. We estimate that in 2016, our share of the centrally-milled and in-lab milling segment was in the single digit range.

THE MARKET FOR DENTAL BIOMATERIALS

The market for oral bone and tissue regeneration products grew robustly in the mid-single digit range in 2016. As biomaterials are frequently used to support implant procedures, the market exhibited similar growth to the implant and prosthetic market. Our geographical expansion has provided us with a more accurate picture of this sub-segment, which is estimated to be worth CHF 600 to 700 million.

Due to our late entry and the fact that botiss biomaterials do not yet have regulatory approvals in most markets outside Europe, the respective market shares are still low compared with our core business. The potential of this business should help the Group to grow successfully in the coming years.

The biomaterials market can be divided into three segments:

- Bone-graft materials
- Membranes
- Tissue-regeneration products.

Bone-graft materials form the largest segment and account for more than 60% of the market. They are used mainly in dental implant procedures, but sometimes to preserve a tooth extraction socket, and in smaller volumes in periodontal procedures. Thanks to successful collaborations with botiss and other partners, the Straumann Group has been able to roll out comprehensive guided-bone regeneration solutions internationally and now plays in each segment of the biomaterials market.

BONE GRAFT MATERIALS

It is currently estimated that every other implant patient¹⁸ requires bone augmentation or graft procedures. Four types of bone graft material are commonly used:

- Autografts (patient’s own bone)
- Allografts (human donor bone, e.g. Straumann Allograft, botiss maxgraft)
- Xenografts (bone sourced from animals, e.g. Straumann Xenograft, botiss cerabone)
- Synthetic bone (e.g. Straumann BoneCeramic, botiss maxresorb).

Traditionally, European dentists tend to use xenografts, while Americans prefer allografts, so the markets are regional. In 2014, Straumann entered the xenograft segment, which accounts for 45–50% of the bone graft substitute market. The synthetic and allograft segments make up 15–20% and 35–40% of the market, respectively, and the Group has been present in both for more than five years.

MEMBRANES

Oral membranes are used in up to 60% of bone augmentation procedures¹⁹ and act as barriers to prevent the

growth of soft tissue in the space required for bone formation. Straumann has competed in this segment since 2010.

SOFT TISSUE REGENERATION

Between 10 and 15% of the overall population in developed countries suffer from severe periodontitis²⁰, a common cause of tooth loss. To treat the disease, periodontists or general dentists aim to regenerate the tissues that anchor the tooth if they have been damaged by periodontal disease. Through its product Emdogain, Straumann leads the segment for soft tissue regeneration and its share of this segment is more than 50%.

REFERENCES/FOOTNOTES

- 1 Marketsandmarkets 2014, Renub Research 2016 and Straumann estimates.
- 2 Liljestrand JM, et al. Missing teeth predict incident cardiovascular events, diabetes, and death. *J Dent Res*. 2015.
- 3 Michaud DS, et al. Periodontal disease, tooth loss, and cancer risk in male health professionals: a prospective cohort study. *Lancet Oncol*. 2008.
- 4 Decision Resources Group 2015, MarketsandMarkets 2013 and Straumann estimates; largest 65 countries are considered.
- 5 Pulse of the industry, Ernst & Young 2016.
- 6 Source: company information.
- 7 iData 2014.
- 8 American College of Prosthodontists, 2016; www.gotoapro.org/facts-figures.
- 9 Bruce A et al. Dental caries and tooth loss in adults in the United States. *NCHS Data Brief*, No. 197, May 2015.
- 10 Deutsche Mundgesundheitsstudie V, 2016; p. 593.
- 11 Mayra Cardoso et al. Edentulism in Brazil: trends, projections and expectations until 2040. *Ciênc. saúde coletiva vol.21 no.4 Rio de Janeiro Apr. 2016*.
- 12 iData Research 2015, EU manual of dental practice, C. Barnes & Co Worldwide Offices of Dentists Industry, OECD health statistics 2014.¹³ iData USA 2015.
- 14 DRG 2015, iData 2015 and Straumann study of 5000 US respondents conducted by AFG Research in 2012.
- 15 Exevia, 2014, based on market research data in Germany, Italy, Spain and the US.
- 16 Source: Key Group 2015, Straumann estimates.
- 17 Source: Key Group 2014.
- 18 Straumann estimates based on MRG and iData.
- 19 iConsult, 2014, based on market research data in Germany and the US.
- 20 Erik Petersen and Hiroshi Ogawa; Strengthening the prevention of periodontal disease: the WHO approach, *J. Periodontol* 2005; 76:2187–2193.