

Research in Periodontics – Where Have We Come, Where Are We Headed

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Received: October 13, 2016; **Published:** November 10, 2016

The amazing maze of periodontal research is a voyage of discovery from the known to the dangerous unexplored shores of unknown. It is the foundation of all our knowledge and progress as Neil Armstrong rightly quoted “Research is creating new knowledge.

Hudson Maxim (1853-1927) quoted “All progress is born of inquiry, doubt is often better than over confidence, for it leads to inquiry and inquiry leads to invent.

Research is used to establish or confirm the facts, reaffirm the results of previous work, solve new or existing problems, support theorems or develop new theories. It can be explained as formalized curiosity, poking and prying with purpose as rightly said by Neale.

Webster defines research as a studious inquiry or examination, especially investigation or experimentation aimed at the discovery and interpretation of facts revision of accepted theories or laws in the light of new facts or practical applications of such new or revised theories or laws. The panorama of periodontal research as explained by Creswall is a process of steps used to collect and analyze information to increase our understanding of the topic or issue. Three steps are – to pose a question, collect data to answer the question and present an answer to the question. Approaches to research depend on “Epistemologies” – Theory of knowledge which vary considerably both within and in between humanities, sciences and eras.

Descartes once quoted – the only way to find anything that could be described as “Indubitably true would be to see things clearly and distinctly”. Periodontics has a rich heritage which unfortunately is neither widely taught nor read; it began in antiquity with a valiant band of people who appreciated the value of research. This is interesting because the objects of most researchers are to achieve a better understanding of reality than others before them because truth is universal and cannot be hidden ignorance for long.

On the contrary, a few view researches with contempt, as people shut away in their academic ivory towers and divorce themselves from reality in their mind palaces. Waiting for lightning to strike, thunder to roll and boom a brilliant prodigious idea – Common we are in 21st century, does it really happen??

There are also a paranoid few who view research as a closed shop with a hidden secretive agenda, full of conspiracies and ready to prosecute its opponents. And on the other extreme, a few souls view research with awe, a perspective derived from respect of their teachers and knowledge of the mysterious laboratories and feel the researchers are beyond criticism of ordinary mortals. Research has always benefitted from the thoughtful criticism, whatever the source. To form a professional judgment and to inform and advise the patients correctly mentioned “Knowledge Is Power”.

A simple classification of research study types includes theoretical, *in vitro*, *in vivo* animals and humans. They are further subdivided for better understanding as theoretical studies can be reviews, modelling and statistical in nature. *In vitro* study comprises of microbio-

logical, histological, immunological, biochemical, genetic and cell cultures. *In vivo* animal studies can be analogical, therapeutically and toxicology studies and human trials include observations, investigations, clinical trials and cohort studies.

Theoretical studies employ existing data to see whether further conclusions are forthcoming. New research models may be developed from an assessment of past of past research models may be developed from an assessment of past research and because of the complexity of measuring periodontal disease, there is also strong tradition of statistical research.

The process of experimental research has a basis in theory. Ideas are tested to see whether they are correct. Someone rightly said – Imagination is more important than knowledge, knowledge is limited, imagination encircles the world and this holds very true in the light of the fact that - unless u believe u shall not understand, Aurelius.

Where have we come from??

In 1909 Guerini approaching the monumental task of writing the most inclusive and detailed history of dentistry chose to divide by historical eras. It began in antiquity and progress to the close of the 18th century. Many approaches to the therapy currently understood as original were fashionable in earlier forms. A great depth is owed to people like Sachs, Hirschfield, Frolich, Proskauer, Merritt and numerous others who compiled detailed works from which both inspiration and substance have been drawn.

Hirschfield in his classical work, the tooth brush its use and abuse (1939), he noted that it was common for our Simian ancestors to use bits of straw as toothpicks. Angled tooth brush heads as well as an interproximal brush were advocated for use more than 140 years ago, although some of these have presented as new designs in the last few years. Celsus, a Roman physician of the 1st century used the first used the term tartar to describe the concretions found on the teeth. He recognized the periodontal abscess and described the surgery of the gums which included the cautery and lancet. Albucasis (936 - 1031) included illustrations of the instruments specifically designed for dental procedures including that of both scalers and small surgical knives.

The middle ages added little but myth and superstition to medical or dental knowledge.

Before the turn of century, Fauchard recommended removal of diseased tissue by surgical means. Robicsek proposed deep gingivectomies with removal of bone. Bone surgery was a part of periodontal therapy. It was thought to be infected or necrotic in areas of periodontitis and thus the only possible rational treatment at that time was the removal. Most of the practitioners including Newman, GV Black, Zentler, Ward and Kirkland accepted this concept. Flap surgery at the time was considered to be radical with removal of all tissues in the areas of disease.

Flap surgery was introduced in periodontics at the end of century by the group of physicians specializing in dentistry such as Widman, Newman and Cieszynki. Newman claimed the introduction of the mucoperiosteal flap surgery as early as 1911. In 1918 widman introduced the widman Flap. Cieszynki introduced reverse bevel incision in the periodontal surgery. In 1935 Kronfeld and late Orban (1939) told bone removal was eliminated as rationale for flap surgery. In 1939 Carranza introduced pocket elimination surgery. In 1954 Naber's described the apically repositioned flap.

In 1960 Loe and co-workers started a series of experiments and proposed non-specific plaque hypothesis. By 1970 the specific plaque hypothesis came into the picture which is still accepted. 1960 Lisgarten showed long junctional epithelium can be re-established which mimics the healthy junctional epithelium. Three major concepts in periodontal therapy which changed the course of history are the concept of bone and its involvement in periodontitis, true nature of soft tissue to tooth attachment and finally the pocket elimination philosophy. In modern day, periodontal treatment, pocket elimination is not so emphasized as host response modulation to control inflammatory response. The human micro-biome consists of the diverse array of microbes. The goal of anti-infective part of periodontal therapy is to strike host microbe balance rather than reduction in a few putative perio-pathogens. Human microbiome project was a revolutionary step which described the taxonomic and functional result of the genetic analysis of the human microbiome. They reveal extensive intra

and inter individual variation of microbiota of each body habitat. It's the host which is of prime importance and controlling its activities at cellular and molecular levels and its manipulation is the key.

Risk factors may be modifiable and non-modifiable and increases the probability of disease occurring. At the current time, there are no fully validated formal risk assessment methods for estimating risk assessment or the recurrence of periodontitis in a treated population. Prototypes of the risk assessment systems have been developed but none thoroughly tested for clinical utility. Present ongoing research is based on it, and it shall form the stepping stone for the future endeavors.

Where are we headed??

Future in periodontology is promising and exciting. In diagnostic area, new insights toward mechanisms of bacterial pathogenesis in periodontics, effect of systemic disease on periodontium new technology and method for radio-diagnosis of periodontal disease progression are being investigated.

Developments in material sciences with a focus on cranio-facial / periodontal indications, protein based technologies and cell based therapies with special emphasis on induced pluripotent stem cells may change the nature of current biomaterials and widen their clinical horizons.

One of the challenges of periodontal diagnostics in the future will be to develop tests which help in evaluation the restoration of health associated homeostasis. Saliva based tests are under development for the detection of pancreatic carcinoma, oral squamous cell carcinoma and Sjogrens syndrome.

The futuristic 5 Ps – predictive, preventive, personalized, participatory periodontology has come a long way and still has miles to cover. 5 diagnostic level - High tech diagnostic tools, genetic susceptibility, bacterial infections, host response, tissue derived products shall unlock the avenues of future perspective and help to tap the unlimited potential of periodontology as a science.

Periodontal research pushes us to see beyond and challenge the clinically successful concepts. It may be in the various field like diagnosis- that may include microbiological testing, cultures, microscopic identification, assays of enzymes produced by bacteria, immunoassays, biosensors, nucleic acid probe, cone beam computed tomography. Analysis of disease activity-enzymes found in gingival crevicular fluid, genetic analysis. Aspects of disease control - bisphosphonates to inhibit bone loss and bone stimulation and surgical techniques - microsurgery which offers new possibilities for periodontal surgery can improve therapeutic result for a variety of procedures and gives benefits of improved cosmetics, rapid healing, and minimal discomfort and enhanced patient acceptance.

New technologies have been developed or are in development that could be used to enhance the ability to predict, diagnose, and treat periodontitis. Not all of these technologies will bear fruit; however, those that do will provide clinicians of the twenty-first century with more effective means of detection, prevention, and treatment than are currently available. The dentists of future will approach oral diseases using a more biological model of health, disease and disease management; an approach more befitting physicians of the oral cavity.

Santayana said, "Those who cannot remember the past are condemned to repeat it". It seems proper in our present consideration of periodontology to pause and pay tribute to the sources of our current philosophy of practice and to once again stress the value of the rich history.

Research is a jumbo machine with churns out ideas and turns them to reality: The world is our laboratory no matter where the discovery takes place, periodontal researchers push the boundaries of science, technology and business to make the world work better. Hence the research is a global community, since times galore forward thinkers towards a common goal: Progress. Therefore, do we need to wait for the albatross to rise from its own ashes or should we just embark on the journey called – THINK!!!

Volume 5 Issue 4 November 2016

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