

A CLINICAL CORRELATION BETWEEN FOCAL INFECTION AND EYE DISEASES

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In the 1959 and 1960 Annual Meetings of the International Association for Dental Research two papers only were on focal infection out of 611 papers; while in the 1966 International Congress of Ophthalmology in Munich not a single paper was on focal infection.

This reveals that the focal infection theory has lost its influence and is no more considered a source for many systemic manifestations as it was in the first decades of the century.

Yet the theory was not completely neglected. Many cases that benefited after extraction of an infected tooth, excision of an infected tonsil or treatment of an infected sinus or ear are still constantly being reported in the literature.

Since long time the etiology of iritis, uveitis and optic neuritis was correlated with focal infection in general and dental infection in particular. No reason was given why other parts of the eye are immune against these foci of infection.

To evaluate and confirm the well established relation of focal infection to iritis, uveitis and optic neuritis; and to study if there is a relation between focal infection and other diseases of the eye; a clinical research was started in my clinic few years ago.

In order to be able to make an accurate correlation, a definite, consistent and well controlled technique was used in the examination and follow up of all cases reported.

A strong light and a magnifying loop were used in the investigation. Pyorrhetic teeth, with pus and/or blood coming out spontaneously, or by pressure on the

gum; caried teeth, stuffed or non-stuffed, that have lost their nerve, pulp and color; peeping out wisdom teeth with infected pockets or operculums; inflamed palate due to a bad denture, with or without sucking cups or grooves were all considered potential foci of infection that should be removed, if they could not be treated and cured. Roots, apical abscesses, granulomas and fistulas, and infected big tonsils were considered as foci of infection and should be treated by removal of the roots or teeth and treatment or excision of the tonsils. Sinusitis was discovered by feeling of tenderness in the region of all the sinuses. Any suspicion was confirmed by X-ray. Otitis media was easily diagnosed. Treatment of infected teeth, sinusitis and otitis media were trusted to the specialist. Rarely was the focus of infection outside the orifices of the head.

Once this survey for foci of infection was over, a thorough study of the eye manifestations or diseases was started with all the modern means of diagnosis available. Then the results were correlated with the pathogenic foci of infection and reported.

Report of Example Cases

A. Chalazion

J. A. K., A 30-year-old woman, was seen April 1, 1966, with two chalazions in the left lower lid. She stated that these chalazions were formed just after extraction of a left upper infected molar and subsequent inflammation of the gum.

B. Spring Catarrh

T. S. T., an 11-year-old girl, was seen June 1, 1966, with huge catarrhal follicles in both upper lids and advanced invasion of both corneas, reaching very near to pupillary region, of 7 years duration. Photophobia lacrimation and redness were excessive. Previous treatment with cortisone drops did not improve much the condition and the catarrh was getting worse every day. The left eye was more affected. She had big infected tonsils (the left one bigger), red, edematous and inflamed gum around peeping out permanent teeth and some infected pyorrhetic teeth in the lower jaw. Surgical excision of the follicles in the lids followed by local treatment with 2% Silver nitrate, prednisolone drops, and systemic treatment of the infection of the tonsils and teeth with Denkamycin injections, im, and Kenacort tabs., p. o., improved the condition considerably; less tearing and photophobia, and clearing of corneas.

Suddenly a right lower molar got infected and an acute apical abscess was formed that extended to the cheek. An acute keratoconjunctivitis was formed immediately in the right eye (the better eye) only, with increased photophobia and

lacrimation. The left eye remained quiet. The right eye quieted down after extraction and treatment of the infected molar.

After a short period of increasing improvement the catarrh recurred in both eyes. The cause was, this time, an acute inflammation of both tonsils. Excision of the tonsils was recommended, otherwise systemic treatment with antibiotics, sulfa and corticosteroids should be repeated. The patient was not seen again.

C. *Lachimal Apparatus*

E. A. T. Z., a 30-year-old woman, was seen April 16, 1966, with obstruction of the left lacrimal duct. She had an apical abcess of a left upper incisor on the same side, the rest of the teeth being normal.

2. A. A. K., a 35-year-old man, was seen May 5, 1966, with stenosis of the left lacrimal duct and swelling of the sac. He had an apical abcess of the left upper canine on the same side, the rest of the teeth being normal.

D. *Conjunctivitis*

N. M. S., a 4-year-old girl, was seen October 19, 1966, with an acute purulent conjunctivitis in the right eye only; the left eye was normal. An acute apical abcess, with pus and blood coming out, of a right upper premolar on the same side was found; the rest of the teeth and the left eye were normal.

E. *Pterygium*

A. A. D., a 75-year-old man, was seen September 14, 1966, with a huge subconjunctival hemorrhage and a huge pterygium in the right eye only. The left eye had a mild conjunctivitis — episcleritis. He had an infected root of a right upper premolar on the same side; the rest of the teeth in the upper jaw were out; the lower jaw had no teeth left except the lower incisors, that were degenerated and infected.

F. *Corneal Ulcers*

1. M. Y. A., a 38-year-old man, was seen September 9, 1953, with a dendritic ulcer in the left eye. The ulcer recurred May 2, 1955 and March 16, 1957, when it was discovered that the ulcer came after infection of a left lower molar and the left tonsil. The molar was removed and the tonsil treated. The ulcer did not recur since then.

2. A. A. F., a 52-year-old man, was seen May 6, 1960, with a recurrent dendritic ulcer and keratitis decemetitis of long duration. The ulcer and keratitis recurred many times in each of the years 1961, 62, 63, 64 and 65. After extrac-

tion of all the pyorrhetic infected teeth on the left side the ulcer did not recur until February 6, 1967 (after 1 year and 5 months), when he was exposed to hard work, bright sun and high wind. The remaining left upper canine and lateral incisor were found infected, the wind and fatigue in the sun were precipitating factors.

3. M. H. S., a 42-year-old woman, was seen March 20, 1961, with a wide ulcer in the cornea of the right eye, which was treated and cured. The ulcer recurred only January 13, 1966, immediately after extraction of a right upper infected molar and inflammation of the gum following the extraction.

G. Subconjunctival Hemorrhage

S. I. D., a 52-year-old teacher, was seen February 19, 1965, with a huge subconjunctival hemorrhage in the left eye. An infected pyorrhetic left upper molar on the same side was found. Four months later he had an acute apical abscess of a right upper molar that extended to the right cheek. Immediately after the abscess another subconjunctival hemorrhage was formed in the right eye on the same side. The hemorrhage began to get absorbed as the abscess began to clear.

H. Iritis

J. O. V., a 52-year-old man, was seen April 2, 1954, with a new attack of a recurrent iritis in the left eye, which was treated and controlled. He had advanced pyorrhea in all his teeth and chronic otitis media, (after an accident), in the left ear since 1927. September 22, 1954, he had a new attack of iritis and hemorrhage in the left eye, which could be well controlled by antibiotics, corticosteroids and fever therapy. April 17, 1958, he had another attack of iritis and secondary glaucoma in both eyes. March 20, 1959, he had an attack of glaucoma only in both eyes. The iritis and glaucoma were well controlled and did not recur since then. The otitis media in the left ear cleared also and did not recur. The cure of the eyes and ear was complete after total extraction of the pyorrhetic teeth and local and systemic treatment of the eye and ear manifestations by antibiotics, sulfa, corticosteroids and fever therapy.

I. Glaucoma

1. M. S. A., a 37-year-old man, was seen February 25, 1965, with chronic simple glaucoma in both eyes. All his teeth had advanced pyorrhea. With the glaucoma treatment (pilocarpine and diamox), all the teeth on the right side only, in both jaws, from midline to the right were extracted. March 2, 1965, the tension in the right eye fell 10 mm Hg, while in the left eye it fell only 5mm Hg. Vision in the right eye improved 5ft. and in the left eye only 2ft. Patient was asked to remove his teeth on the left side. Patient did not return.

2. K. Y. H., a 75-year-old woman, was seen March 28, 1966, with chronic simple glaucoma in both eyes. All her teeth were pyorrhetic. She was asked to remove all her teeth, but she removed the teeth on the right side only. April 2, 1966, tension fell 5mm Hg in the right eye and 0-1mm Hg in the left eye; the glaucoma treatment was the same for both eyes. Antibiotics were used also.

J. Cataract

1. H. Y. H., a 60-year-old man, had iridencleisis for glaucoma in both eyes November 25, 1963. Vision after surgery was $6/18 \pm$ in the right eye, and $6/9 \pm$ in the left eye. His teeth were all pyorrhetic. He was asked to remove them all. October 22, 1964, vision in the right eye was still $6/18 \pm$, but was counting fingers at 18ft. in the left eye. The left eye had a developing cataract and signs of previous mild iritis. All the teeth have been removed, leaving a root in the left upper jaw on the same side of the iritis and cataract newly formed.

2. M. Z. I., an 80-year-old man, had a cataract extraction in the right eye April 22, 1965. The left eye had a posterior capsular and central lens change. Vision in the left eye was $6/36 \pm$. His teeth in the upper jaw were all out except for a root and two infected molars on the left side. June 18, 1965, vision in the left eye improved to $6/9 \pm$ after extraction of the remaining root and two infected molars in the upper jaw on the left side, and the use of antibiotics and corticosteroids.

3. K. I. C., a 55-year-old woman, was operated for glaucoma in the left eye February 8, 1958. The right eye was blind with absolute glaucoma. She had an immature cataract in the operated eye. Vision was finger-counting at 6-8ft. after surgery. Vision remained the same in check-ups of 1959 to 1961. Seen September 28, 1965, her vision improved to $6/36 \pm 1$. This improvement came 7 years after surgery for glaucoma, although the cataract was still present. The improvement came after extraction of a right upper infected premolar.

4. K. G. B., an 8-year-old boy, was seen February 26, 1965, with a posterior polar and central lens change in the left eye. The eye received a mild blow a year ago. Vision was 6/6 in the right eye and counting fingers at 20 cm. in the left eye. Treatment of an abscess in the left lower first premolar (by antibiotics and corticosteroids), and extraction of a degenerated, caried, infected milk tooth riding over the peeping out tooth implanted in the infected gum, improved vision in the cataractous eye from counting fingers at 20 cm. to $6/36 \pm$ in 12 days. The cataract began to clear partly and fundus was better seen. Later vision failed again to finger-counting at 10ft. because his father stopped systemic treatment with antibiotics and corticosteroids, insisted on surgery, refused to continue treatment and disappeared.

K. Retinal Detachment

1. M. S. D., a 51-year-old man, was seen November 20, 1961, with a detachment of the retina in the lateral quadrant, at 3 o'clock, of the left eye, of one day duration. Vision was $6/36 \pm 2$ in the right eye and finger-counting at 4-5ft. in the left eye. A beginning of lens changes was noticed in both eyes. Absolute bed rest, bandaging both eyes, cortone and atropine drops locally, antibiotics and corticosteroids systemically, and extraction of all the pyorrhetic teeth on the left side, reattached the retina in 28 days and vision improved to $6/12+$ (with correction).

2. H. A. H., a 25-year-old woman, was seen March 27, 1963, with detachment of the retina in the left eye from 4-8 o'clock. Tension was soft. Vision was finger-counting at 20cm. Extraction of a left upper infected wisdom tooth; irregular bed rest; systemic treatment with antibiotics and corticosteroids; local treatment with atropine and cortone drops, reattached the retina partly in 3 months and completely in 6 months. Vision improved to finger-counting at 18ft., without correction. March 23, 1966, the retina was still attached and vision was the same.

3. M.M.K., an 8-year-old boy, was seen September 26, 1966, with a detachment of the retina in the lower quadrant of the left eye and a big hole at 6 o'clock. Tension was 38 Schiotz and flare was positive (++) in the anterior chamber. Vision was 6/6 in the right eye and light perception, no direction in the left eye. Bed rest and bandaging both eyes, treatment of an abcess of a left lower premolar; and extraction of a riding, degenerated and infected decayed milk tooth; local treatment by cortone and pilocarpine drops; and systemic treatment by antibiotics, corticosteroids and diamox improved vision to finger counting at 4-5 meters in 33 days. The retina was reattaching and clearing. The right eye was normal and the rest of his teeth were normal. The patient disappeared for no known reason.

L. Retinitis

1. A.S., Abou Gh., a 16-year-old boy, was seen March 4, 1966, complaining of failing vision in both eyes. His vision was $6/60+1$ in both eyes. He had otitis media chronica since young. His teeth, tonsils and sinuses were apparently normal. The macular regions in both eyes were covered by white scar-like streaks and the foveas were not well demarcated. Treatment of the otitis media locally and systemically by antibiotics and corticosteroids, improved his vision to $6/18+$ (without correction) in both eyes, and the maculas cleared, in 11 days.

2. N.M.H., a 55-year-old man, was seen April 19, 1964, with hemorrhage in the right macula. All his teeth were removed except the right upper canine and

first premolar, which were highly infected and their infection has extended to the neighbouring maxillary sinus. Both tonsils and ears were normal. The hemorrhage was on the side of the infected teeth and sinus. The other eye was normal.

M. Optic Neuritis

N.A.M., a 49-year-old woman, was seen November 2, 1965, with optic atrophy in the right eye. Vision was 6/6 in the left eye and finger-counting 3-4ft. in the right eye. Vision improved to finger-counting at 18ft. with antibiotic and corticosteroid treatment. But vision improved to 6/9±+++ from side, May 21, 1966, after she had completed the extraction of 6 highly infected teeth on the same side, and the same treatment with antibiotics, corticosteroids and fever therapy.

Discussion and Conclusion

“Case histories of patients receiving distinct benefit from elimination of foci of infection are constantly being reported in medical and dental literature. Included are conditions such as subacute bacterial endocarditis ¹, torticollis ², menieres syndrome ³, glaucoma ⁴, infectious diseases of the eye including uveitis ⁵, ⁶, iridocyclitis, tenonitis, episcleritis and optic neuritis ⁷, dermatitis ⁸, arthritis ⁹, rheumatic fever ¹⁰, and bacterial allergy ¹¹, ¹², ¹³”.

In spite of the cases quoted above by Oartel ¹⁴, those I have reported and many others on record, we find that the focal infection theory is given no attention in common practice. The reasons quoted by Grossman ¹⁵ to discredit the theory were the following:

1. “Many patients with diseases presumably caused by foci of infection have not been relieved of their symptoms by removal of the foci”.

Comment: This statement is wrong for the following reasons: (a) According to Cecil and Angevine ¹⁶, removal of the tonsils gave a relief in 93% of rheumatic cases, because the microbes, viruses or toxins were removed with the tonsils, and no microbes, viruses or toxins were thrown during or after surgery into the circulation. (b) Removal of an infected tooth may give a relief or an exacerbation, depending on (1) the degree of infection of the tooth and the gum before and after extraction; (2) the amount of microbes, viruses, and toxins that go to the circulation during and after extraction; (3) the degree of irritation of the neuro-vegetative system during and after extraction until the gum heals. (c) The microbes, viruses or toxins that go to the circulation during or after extraction, or have already been established in a secondary focus, continue their effect on the organ they have invaded, and this focus may act as a primary

focus. These microbes, viruses or toxins should be destroyed by antibiotics, corticosteroids and fever therapy so that the organ affected goes back to normal.

2. "Many patients with these same systemic diseases have no evident focus of infection".

Comment: Arnett and Ennis ¹⁷, and many other authors, considered roentgenologic examination of the teeth and the absence or presense of an apical abcess, the basis or criterium for the correlation between dental foci and rheumatism or heart disease.

This criterium adopted by Arnett, Ennis and many if not all previous authors was wrong for the following reasons. (a) Not all apical abcesses show on X-ray. (b) Apical abcesses, which can be easily seen with the naked eye and need no X-ray, make a small percentage of dental foci. Roots, advanced pyorrhea, apical fistulas and granulomas, pockets of infection or operculums over peeping out teeth, especially wisdom teeth, inflamed gum or palate by a bad denture and inclusion of roots or unerupted teeth; not to forget acute and chronic infection of the tonsils, sinuses and ears make a greater source of focal infection than apical abcesses. Therefore the above statement is not true and the criterium was wrong and misleading.

3. "Foci of infection, according to some statistical studies, are as common in apparently healthy persons as in those with disease".

In support of the above statement Wood gave the following statistics:

"Dental foci of infection found in 500 patients with cataract (not due to infection) as often as in 500 patients with uveitis".

After I proved that dental infection was a cause for cataract formation, Wood's statistics become consistent with my findings and in favor of the theory rather than against it.

Yet many patients have advanced foci of infection in their teeth and have no apparent systemic manifestations. There are many reasons for this apparent asymmetry or contradiction.

1) No systemic correlation was made before between foci of infection and all diseases of the body and systemic diseases were not traced back to any possible focus of infection.

2) Only apical dental abcesses were considered in most previous studies and the other foci (mentioned before) were overlooked.

3) Focal infection in its chronic form (pyorrhea, roots, pockets, etc.) works so insidiously and the manifestations may be so mild and varied that they pass unnoticed by the physician and patient.

4) Focal infection in its acute form (adopted and favoured until now), (acute tonsillitis, apical abscess etc.), produces the well known manifestations: Uveitis, bacterial endocarditis and rheumatic heart disease.

5) Most of the foci of infection are painless and are overlooked by the physician, dentist and patient as a cause for many diseases.

6) Authors are still unable to explain satisfactorily the mechanism of action of the foci of infection. Here is a brief review of the work done in this field.

- a) Asano ¹⁸, demonstrated the presence of mycobacterium leprae in the dentinal tubules of leprous patients. Smaller microorganisms like cocci can more easily invade the tubules and become well protected against effective local and systemic treatment.
- b) Macdonald ¹⁹, proved that tetanus toxin sealed in the teeth of animals has penetrated the dentinocemental junction and has caused the death of experimental animals.
- c) Selye ²⁰, injected into rats various putrified proteins and got an endocarditis and myeloid infiltration in the spleen, renal pelvis and liver. He called this: "Focal syndrome".
- d) Rosenow ²¹, after many experiments, considered the streptococcus viridans, with its elective affinity and transmutability, responsible for the different secondary manifestations.
- e) Roulacroix ²² experiments on secondary reactions or "Microbes de sortie":
 - (1) Koch phenomenon (generalized T. B. after first injection of Koch bacilli and localized abscess formation only on second injection).
 - (2) Tuberculin reaction (no reaction in normal animals, generalized T. B. in infected animals).
 - (3) Sanarelli's experiment (no cholera formed after a first minimal dose of vibrios iv; cholera formed after a second minimal dose injection of vibrios or toxins).
 - (4) Chwartzman's phenomenon (no cholera formed after first minimal dose injection of vibrios; cholera and a local ulcer rich in vibrios are formed after a second subcutaneous injection of B. Proteus or B. coli).
- f) Klinger and Rosle, Berger, Ravault and Bickel ²³: Toxinemia theory. These authors consider that toxins (septic discharge and heterogenous proteins) act as antigens and produce antibodies by selective sensitization of organs. Inflammation is a reaction between the antigens (toxins) and the antibodies in any organ.

g) Speransky's ²⁴ nervous theory experiments.

- (1) Irritation of the 2nd and 3rd branches of the trigeminal nerve with crotonoil resulted in herpes labiales, tongue abscess, conjunctivitis and otitis media.
- (2) Separation of 2nd branch from 3rd branch of trigeminal and irritation of central end resulted in edema of face and conjunctiva, inflammation of the lips and tongue, even on the other side of the face also.
- (3) Irritation of the base of the brain near tuber cinerium of a dog by a pea or glass resulted in muscular cramps previous reactions of experiments (1) and (2) and distant reactions in the lung, stomach and intestines (hemorrhages, ulcers).
- (4) Sealing of irritant (formal, croton oil, arsenical paste) in normal tooth of dog resulted in same lesions in lung, stomach and intestines.
- (5) Sealing of irritant and extraction of tooth before the manifestations appear resulted in same manifestations and the dog died.

These experiments showed clearly that irritation of the central as well as the peripheral nervous system gave similar results and that removal of the primary focus did not stop the secondary reactions. Focal infection produces two types of reactions in the eye:

- a) Infectious reactions: Chalazions, dacryocystitis, orbital abscess, etc.
- b) Vasomotor reactions: Spring catarrh, cataract changes, iritis, macular edema and degeneration, optic atrophy, vascular occlusion and hemorrhages.

These reactions are insidious and may remain latent for months or years until they are precipitated by another factor like traumatism, extraction of an infected tooth, fatigue, cold, influenza, nervousness, etc. The microbes, viruses or toxins are transmitted to the eye either by contiguity (like dacryocystitis) or by the venous circulation (like pterygium, iritis...) or by the neuro-vegetative system (like optic atrophy, etc.).

In practice, any pathology in the eye did not clear completely until the foci of infection were controlled or removed otherwise recurrence was the rule.

Most dentists and all patients care more for the element of pain in the teeth than to the quality or quantity of the pathology. As a result many bad pyorrhetic teeth, roots etc. etc. are left without radical treatment and the patient, who is the victim, is not aware of this danger.

Focal infection attacks other organs of the body other than the eye. Out of many examples on record here is the story of one I lived.

In 1933 I had a swelling of the first interphalangeal joint of the right middle finger. X-ray of the finger showed no pathology in the joint, no diagnosis was made and the finger regained its form after exercise of the finger only. In 1955 I had recurrent occasional pain in the right knee. In 1963 I had pain and swelling of the right foot and could no more wear my shoe. Blood and urine analysis was negative except for few uric acid crystals. Elastic bandage, diet poor in uric acid, and a medication to dissolve the uric acid crystals were recommended. No explanation was given to a localized swelling of only the right foot.

Since I was aware of the relation between dental pathology and rheumatic arthritis and since I had advanced pyorrhea in all my remaining teeth, I decided to extract all my teeth. After extraction, the pain and swelling of the foot disappeared and the foot and knee regained normal function. No medication was used as a treatment and no diet restriction of any degree was followed. Four years passed and no recurrence took place. An occasional fulminating precordial pain and fibrillating contractions of the left shoulder muscles and adductor muscles of the right thumb, which I used to feel from time to time disappeared completely also.

The above example in general medicine, those mentioned in my report, those reported by Oartel and many others on record show without doubt that focal infection plays a great role in the pathogenesis of many diseases of unknown origin, called essential, idiopathic, arthritic or congenital.

In the light of the above findings I recommend the following:

- a) Every physician should start the physical examination of his patient by looking for focal infection first.
- b) Foci of infection, when found, should be treated and cured completely before or together with the treatment of the disease the patient complains of.
- c) After curing or removing the primary focus, the secondary focus should be treated and cured also.
- d) Dentists should reconsider their techniques and therapy.
 - 1) Wisdom teeth with pockets or operculums should be removed because they can not be definitely cured, and remain a constant potential focus of infection.
 - 2) Caries that destroy the pulp and reach the dental nerve should be carefully watched; and devitalized, discolored, pulpless teeth should be condemned.

- 3) Pyorrhetic teeth (specially advanced pyorrhea) should be treated and definitely cured or removed.
- 4) Removable bridges should replace fixed bridges because they can be cleaned during the day and remove at night.
- 5) Dentures should have no suckers or grooves, cleaned after each meal and removed at night. Narrow dentures without palate also produce an impression in the hard palate and produce a new focus of infection.
- 6) Unerupted wisdom teeth should be X-rayed after the age of 20-25.
- 7) Infection of the tonsils, sinuses and sometimes the ears, is usually caused by infection of the teeth. Both foci should be treated and cured.
- 8) Dental infection during pregnancy should be treated and cured before delivery because it has much return on the health of the fetus and child.
- 9) Nutrition rich in calcium (milk) and vitamins A, B, C and D should be stressed by the dentist as an important factor for good healthy teeth.
- 10) Smoking digs the grave for the teeth and sick teeth dig the grave for good health. Dentists should prohibit smoking.
- 11) For a better health we need more dental care, more dentists, a higher academic standard of dentistry and more availability to the poor.
- 12) The public should be informed more about the relation between good teeth and good health and the importance of dental care in life expectancy.

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