Pedicle Flaps Contribute to Endoscopic Skull-Base Surgery and Facial Soft-Tissue Repair: The Diuturnity of Johannes Fredericus Samuel Esser (1877–1946)

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Abstract

Keywords

- pedicle flaps
- external and internal maxillary arteries
- facial soft-tissue repair
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- diuturnity
- Johannes (“Jan”) F. S. Esser

Pedicle flaps based on the *external* maxillary (facial) artery were introduced during the World War I, precisely a century ago. Today they remain effective tools in facial soft-tissue repair. Recently, pedicle flaps based on the *internal* maxillary (sphenopalatine) artery have been chosen to reliably close dural defects after endoscopic skull-base surgery. Pedicle flaps, “biologic” to the extent they are based on a defined arterial blood supply, are the lasting contributions—the diuturnity—of Johannes (“Jan”) Fredericus Samuel Esser (1877–1946) of Leiden, Holland, and Chicago (IL).

Dramatic need on the battlefield and trauma in an increasingly mobile society have often been the firebrands of novel surgical invention.¹ Look no farther than the eastern European front during the World War I (7/1914–11/1918) to witness the innovative development of arterial-based pedicle flaps by Johannes (“Jan”) F. S. Esser and a team of Dutch colleagues.

The setting: the 1914 Russian invasion of Galicia.
 The players: the citizens and armies of Austro-Hungary, Germany, and Russia.
 The surgical innovation: the arterial (axial) pedicle flap.
 The saga over a century: maxillofacial and craniofacial repair.
 The diuturnity: the lasting contributions of Johannes F. S. Esser.

Johannes Fredericus Samuel Esser (1877–1946)

Parental deaths and family circumstance mandated “Jan” (Johannes Fredericus Samuel) Esser and his older sister, “Betsy,” be adopted in their youth by Jacob and Ant Splinter, owners of a grocery store named *Den Gouden Bal*, located “at the corner of the Korte Mare and Lange Gracht” in Leiden, Holland.²

Leen Spruyt, the owner of a dairy shop adjoining *Den Gouden Bal*, taught Jan Esser the basic principles and board discipline of chess. The game captivated the youngster; eased his sorrow; gave him focus; and, as he gained chess prowess, increased his popularity at primary and secondary school. With friends and fellow students, he founded a local club and became Leiden’s chess champion in his final years of secondary school (➤ **Fig. 1**).^{2,3}

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Fig. 1 "Morphy Chess Club," Leiden, Holland, 1896 (Courtesy, Barend Haeseker, Esser Foundation, and Erasmus University Rotterdam).

In 1896, Jan Esser entered the University of Leiden School of Medicine at the age of 19 years. By then, he had grown to a height of 6 feet, more in keeping with the phenotype of his father, and at the university participated in cycling, rowing, and weekend student-boxing matches (► **Fig. 2a–c**).

Esser completed his medical education at the Utrecht University School of Medicine but returned to Leiden (where

he began) to take the final examinations,² fulfilling a wish to graduate from Holland's oldest university (founded in 1575).

To gain practical experience after graduation, Doctor Esser took on several locum tenens positions during the years 1903 to 1905, by first serving the villages of Hazerswoude, Herwijnen, Hilvarenbeek, and Polsbroek and then by sailing to the Americas aboard the 1,329-ton ship *Prins Maurits* in the employ of the Royal Dutch West Indies Mail Line (► **Fig. 3**).^{2,4}

Fig. 3 Steamer Prins Maurits, 1915 (Courtesy, Judi Heit and North Carolina Shipwrecks). Available at: northcarolinashipwrecks.blogspot.com/2012/.../steamer-prins-maurits-3-april-1915.html; accessed July 31, 2016.

Fig. 2 (a) University of Leiden (Courtesy, University of Leiden and Wikipedia), accessed January 10, 2017. (b) Jan Esser in London (Courtesy, Barend Haeseker, Esser Foundation, and Erasmus University Rotterdam). (c) University of Utrecht (Courtesy, University of Utrecht and Wikipedia); accessed January 10, 2017.

Fig. 4 Photograph, Philipp Bockenheimer (Courtesy, Historical Collections of the Humboldt University of Berlin Library [13875] and Wikiwand.com); accessed July 31, 2016.

In October 1905, after completing his peripatetic travels, Esser moved to Amsterdam, entered practice as a family practitioner, and settled in a fashionable district of the city. From investments in commercial properties and houses, Esser earned sufficient income to acquire a large collection

of 19th- and 20th-century Dutch paintings, including those by George Hendrik Breitner, Piet van der Hem, and Piet Monderin, according to the records of Singer Museum (Laren, the Netherlands).⁵ In 1908, Esser was elected chairman of the Dutch Chess Association, and in 1913, he became the country's chess champion, winning a play-off match for the title against Dutch chess master and organ player Rudolf Loman (+0 −3 = 1).^{3,6}

In 1912, Curt Kabitzch Publishing (of Wurzburg) released *Plastische Operationen* written by Philipp Bockenheimer, an associate professor of surgery, at the Humboldt University of Berlin (► **Fig. 4**). In his book, Bockenheimer (1875–1933) describes early attempts at transposition of adjacent soft tissue by Johann Friedrich Dieffenbach (1792–1847) and Karl O. Weber (1827–1867); credits nearby soft-tissue advancement to Friedrich Pels-Leusden (1844–1902) and Z-plasty to Erich Lexer (1867–1937); and attributes inaugural reports of full-thickness repair of defects of the cheek to Friedrich von Esmarch (1824–1902) and his illustrator Ernst Kowalzig.⁷

The Bockenheimer tome had a profound influence on Esser and in the year 1913, with the concurrence of his wife, Olga Roelfzema, a law student, he sold the Amsterdam medical practice, to pursue a career in surgery. Over the ensuing 2 years, Esser trained with Hiddo Jan Lameris (1872–1948) in Utrecht; Willem Noordenbos (1875–1954) in Rotterdam; Pierre Sebileau (1860–1953), an otolaryngologist and author of a book on maladies of the cranium; and Hippolyte Morestin (1868–1919), in Paris. For 6 months, Esser was Morestin's scholar-in-residence (► **Fig. 5a, b**).^{8,9}

Fig. 5 (a) Photograph, Pierre Sebileau (Courtesy, Bibliotheque interuniversitaire de Sante, Paris). Biusante.parisdescartes.fr; Accessed July 31, 2016. (b) Photograph, Hippolyte Morestin (https://en.wikipedia.org/wiki/Hippolyte_Morestin; Courtesy, Wikipedia); accessed January 22, 2017.

Fig. 6 Tout Paris—40 Rue Bichat—Hospital Saint Louis en 1900 (Courtesy, Cartes Postales Anciennes de Bastille91Cpa-bastille91.com); accessed August 1, 2017.

At Saint-Louis Hospital, in Paris, Esser observed Morestin perform a number of operative procedures on war-injured soldiers.¹⁰ With the help of the Belgian embassy, he attended a special compulsory course for military surgeons at the hospital, conducted by Pierre Sebileau. In the Sebileau course, videos were used to illustrate selected facial, general, and orthopaedic injuries and depicted reparative procedures, and all the procedures were practiced on cadavers (→Fig. 6).²

By circumstance, Esser was not in Paris when Germany declared war against Russia in August 1914, and return to Paris was proscribed after France closed its borders to foreigners. Wishing to broaden his surgical experience, he accepted an offer to serve the Austro-Hungarian government as a civil war surgeon, contingent upon arriving with operating room support staff, from Holland.

In May 19, 1915, Esser and his Dutch operating room staffs arrived in Brunn, Austria (Moravia), north of Vienna, and not far from the eastern front (→Fig. 7a, b).

The Russian army was driven out of Galicia by Austro-Hungarian and German Army troops. But in the process, the vulnerable Hapsburg dynasty became dependent on German's might and massive support, eventually succumbing to become a German satellite.^{2,11}

a

b

c

Fig. 8 (a) Imperial and Royal Reserve Hospital Number 2. (b) Brunn and Budapest, near the Eastern Front: a map depicting the invasion of Galicia by Russian troops. (c) Esser (center left) with Dutch surgical assistants in Brunn, Austria (Courtesy, Barend Haeseker, Esser Foundation, and Erasmus University Rotterdam).

a

b

Fig. 7 (a) Austrian soldiers prepared to engage Russian soldiers, in Galicia (Licensed by Alamy, Brooklyn, NY; April 10, 2017; Image OY16296487). (b) German wagon supply trains in Galicia, 1915 (Licensed by Alamy, Brooklyn, NY; April 10, 2017; Image OY16297677).

The war-injured soldiers who were at the front arrived at the 3,600-bed facility in Moravia in a steady stream, often requiring repair of extremities and notably primary and secondary repair of midface, panface, or oral cavity injuries (► Fig. 8a–c).

Esser evaluated various procedures promoted by his predecessors: those depicted in the publication by Bockenheimer; in the handbooks of Lexer and Krause; and in the literature by Dieffenbach, Langenbeck, Morgan, Jaesche, and Estlander. And he reflected on his time with Morestin. All suggestions were politely deemed “good help,” by Esser, but “not a single one,” he said, “... fully satisfied us.” The pedicle flap of distant skin “from the arm or wandering flap from the chest” (Tagliacozzi) was singled out for particularly fastidious criticism: “besides disagreeable technic ... [it was] decidedly disfiguring. The color, paleness, hairlessness, flaccidness and other ... qualities,” he charged, “differ so much from the skin of the face, especially in the neighborhood of the nose, that ... [it] only succeeds in closing the defect.”^{12–14}

The pedicle flap based on the facial (external maxillary) artery was a notable favorite and by proper design and advancement, rotation would provide a broad swath of vascularized tissue from the upper neck to repair part of the lower face, the midface and all of the cheek, or, with additional reach, the lower eyelid. An article in the *Annals of Surgery* and the monograph *Die Rotation der Wange* depicted these operative techniques, in 1917¹² and 1918 (► Fig. 9a, d).¹⁵

In the perioral and alar areas, notably the upper and lower lip, Esser accepted the benefits but acknowledged the limitations of more narrowed pedicles based on the nasolabial artery, in terms of postoperative aesthetics, scar, and function (► Fig. 10a, b).^{12,16,17}

These clinical efforts, in what Esser called “operative studies,” benefited not only 700 injured Austrian soldiers upon whom they were attempted¹² but also assured progressive finesse of repairs in Budapest, and then in Berlin, after the Dutch were serially directed to other surgical centers by the German military. Esser and his colleagues repaired disfigurements of thousands of Germany’s war-injured soldiers (► Fig. 11).^{2,18–20}

Discussion

Although the significance of “the circulation” was revealed by Shushruta, Celespino, and Harvey, centuries before Esser’s wartime “studies,” Esser championed the transposition of distant tissue based on a dedicated, arterial blood supply, recognizing it would glean better outcomes. And so it was, he and his colleagues were able to successfully reconstruct maxillofacial soft tissue ravaged by war.^{12–14}

Advancement rotation was Esser’s hallmark accomplishment: it became a literal workhorse, during the War. Breadth and reach of soft tissue from the adjacent neck to repair the lower face, midface, and lower eyelid^{12,21} were successful time and time again, in the worst of circumstance. Nasolabial pedicles, as conceded by Esser, were smaller versions and dependent on a relatively diminutive vessel (the nasolabial), a branch of the “moeder artery,” the external maxillary.¹⁶

These trials and errors lead to novel principles of advancement rotation: (1) the external maxillary artery or its branches would best “lie in the center” of transposed or rotated tissue; (2) tissue from the nearby face or distant ipsilateral neck would suffice, “even for very large (facial) defects”; (3) proper design should require “no unused folded

Fig. 9 Illustrations depicting rotation advancement pedicle from the neck to (a) the lower face, (b) midface, and (c) lower eyelid; Johannes Esser, 1917 (Licensed by *Annals of Surgery* and Wolters Kluwer). (d) Images after rotation advancement pedicle based on the facial artery, from the neck to the lower midface; Johannes Esser, 1917 (Licensed by *Annals of Surgery* and Wolters Kluwer).

Fig. 10 (a) Illustrations depicting pedicle transposition from the nasolabial fold to the ipsilateral lower lip (Licensed by *Annals of Surgery* and Wolters Kluwer). (b) Images after transposition of a pedicle from the nasolabial fold to the ipsilateral lower lip, based on the nasolabial artery, a branch of the facial artery (Licensed by *Annals of Surgery* and Wolters Kluwer).

skin in the turned pedicle” and would provide tissues of similar “color and quality”; (4) “the larger the surface (area of the pedicle) over which the tension is to be ... [distributed] ... the more satisfactory the result will be”; and (5) sutures in the nasolabial fold, in the preauricular area, or in the redundancy of the soft tissue of the neck “should be able,” he suggested, “to bear ... [the] ... tension” of closure.^{12,13,15}

Esser often downplayed the novelty of his operative contributions but over the ensuing century, pedicle techniques based on the external maxillary artery have become ubiquitous in elective reconstruction of the facial mask following soft-tissue trauma or extirpation of cutaneous malignancy.^{18,22–27} An arterial (“biologic”) pedicle flap is also now used to repair dura, upon the completion of

Fig. 11 Wounded soldiers, Esser's surgery clinic, Berlin (Courtesy, Barend Haeseke, Esser Foundation, and Erasmus University Rotterdam).

Fig. 12 Line drawing of nasoseptal pedicle flap based on the sphenopalatine artery and its transposition from the nasal septum to the skull base. Partial amputation of the middle turbinate facilitates access and transposition of the pedicle within the surgical corridor. (Copyright and courtesy, Richard A. Pollock).

endoscopic skull-base surgery in which midline, ventral lesions have been removed. The lesion is approached by way of a surgical corridor, whether trans-cribriform, trans-planum, trans-tuberculum, trans-sellar, trans-clival, or trans-odontoid, using virtual radiography (navigational guidance). The nasoseptal pedicle, consisting of septal mucoperiosteum and mucoperichondrium, is based on the sphenopalatine artery (a branch of the *internal* maxillary artery), as it leaves the sphenopalatine foramen (► **Fig. 12**). The pedicle is “parked” in either the nasopharynx or the maxillary sinus, awaiting the extirpation of the skull-base lesion, as far forward as the floor of the frontal sinus and as far posterior as the craniocervical junction.^{28–31} The flap is rotated into position and buttressed using resorbable oxy-cellulose with thrombin (Surgicel) and cross-linked polyvinyl sponge (Meroce), without the use of sutures.³¹

An Afterword

Jan Esser's saga in Eastern Europe suffered an abrupt change in 1923: his wife Olga died of gynecologic cancer, at the age of 34 years, and his nomination to become a professor at the University was nullified by law, because of his foreign citizenship. Doctor Esser in short order left Berlin to pursue pan-European and international travel, eventually settling with his son in Chicago, IL (► **Fig. 13**).^{5,9}

The arrival of 1941 jump-started his personal biography, while recovering from orthopaedic injuries. During rehabilitation, Esser was able to describe his family history and career to Robert Hart and David Tucker, both patients from Chicago. Their typed manuscript lay fallow until it became the basis for the PhD dissertation of Barend Haeseker (1942–2015).³² To his credit, Haeseker visited appropriate Dutch towns, villages, and cities and made stopovers in Paris, France, enriching many details of the complex pan-European

Fig. 13 Photograph, Jan Esser at mid-life (Licensed by Jan M. Hilbert, Johannes F. Hoenig, European Journal Plastic Surgery, and Springer Publishing).

pathways chosen by Jan Esser during his lifetime.² After revisions, clever on-site embellishment, and editing under the supervision of *promotoren* J. C. van der Meulen, the revised autobiography reached 224 pages. “The tome” was published in 1983 by *Erasmus Universiteit Rotterdam* (Erasmus University Rotterdam), Belgium, with the title *Dr. J.F.S. Esser and His Influence on the Development of Plastic and Reconstructive Surgery*, now housed in the Esser Foundation, Erasmus University Medical Center, Rotterdam.

Johannes Esser was elected Honorary President of the First European Congress of Plastic Surgery, in Brussels. Harold Delf Gillies of Sidcup, England, became the Honorary Secretary of the organization, and in 1940, Esser was made an honorary member of both the American Society of Plastic and Reconstructive Surgery and the International College of Surgeons.²² His efforts to create an international center for “structive” (plastic and reconstructive) surgery were never realized.²³

Esser died suddenly in 1946, just short of entering his Chicago home. He was survived by his autobiography, second wife (Aleida de Koning), six children, and a cadre of well-known trainees, including Gustave Aufricht, Jaques W. Maliniac, and Joseph Safian (► **Fig. 14**).^{5,9,22}

Fig. 14 Photograph, the elder Jan Esser in Chicago, 1941, by Max Thorek (Courtesy, Barend Haeseker, Esser Foundation, and Erasmus University Rotterdam).

Note

Permissions have been obtained from Alamy, *Annals of Surgery* (Wolters Kluwer), and the Esser Foundation Craniomaxillofacial Trauma & Reconstruction (April 23, 2017).

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