



OXFORD CLINICAL  
HANDBOOK

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CURRENT AND EMERGING APPROACHES IN  
**HAIR TRANSPLANTATION  
AND HAIR IMPLANTS**

**KATLEIN FRANÇA**



# FOREWORD

## HAIR: A PIVOTAL ADORNMENT

Hair plays a substantial role in a person's appearance. It renders a multiplicity of functions; it is an object of belief systems and traditions. It is a foremost component in shaping an individual's identity. Hair loss can be stressful for both men and women. Patients with hair disorders frequently experience low self-esteem, anxiety and depression.

There have been consequential advances in hair loss treatments over the past two decades. Surgical hair transplantation is the most effective permanent method of hair restoration. Improvements in techniques and procedures are revolutionizing hair restoration, achieving more natural results and providing enhanced solutions for men and women experiencing hair loss. New implant techniques and devices are increasingly proving safe and effective treatment options. There are now a number of approved artificial hair products available to treat hair loss.

Written by renowned dermatologist Dr Katlein França, this timely handbook explores the basics of hair anatomy and the causes of hair loss as well as salient concepts of Trichopsychodermatology.

*Current and Emerging Therapies in Hair Transplant and Hair Implants* provides a helpful, concise overview of current concepts and basics of hair transplantation, surgery and new hair implant techniques. Current medical treatments for hair loss are discussed, together with a summary of hair transplantation techniques and surgery such as follicular unit transplantation and follicular unit extraction. New technologies in hair transplantation and enhanced methods of hair implantation are delineated in detail.

The aim of this book is to enable the practicing physician to make a precise diagnosis of alopecia type and offer an individualized treatment plan based on patient need.

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## INTRODUCTION

Reports of the first use of hair implants were in 1970's and 1980's. However, the use of artificial hair fibres in hair restoration has been gaining new attention in recent years. [1]

During the 1970s and 1980's, artificial fibres made of polyester, modacrylic, polyacrylic, among others were used in hair restoration with unsatisfactory results and the use of these products was subsequently discontinued. [2] Some of the adverse reactions included [2,3]:

- Severe infection
- Rejection
- Periodic loss of fibres needing frequent replacement
- Body reaction
- Permanent scarring

At this time, the procedure was not performed by medical professionals with a resultant lack of correct asepsis and post treatment protocols.

During the 1990's, research groups initiated a new selection of biomaterials and the development of safer and more reliable medical protocols of hair implantation [1]. In 1995 this technique was considered an exclusively medical act and new professional training centres were established. In 1996, the European Union Authorities, with the Universal Medical Device Nomenclature System™ [ UMDNS] classified artificial hair as medical devices. [1]

## HAIR IMPLANT PRODUCT CHARACTERISTICS

The main characteristics required for a hair implant product are [1,2]:

- Biocompatibility
- Resistance to physical-chemical stress
- Resistance to traction
- Low tissue trauma
- Good aesthetics

### BIOFIBRE®

The hair implant, Biofibre®, is composed of a mixture of medical grade polyamides. This fibre was tested in clinical trials in laboratories accredited by the Italian Ministry of Health and also in histopathological studies. [4,5,6,7]

Biofibre® implants are available in multiple colours, different shapes [straight, wavy, curly and afro] and in different lengths. It is also available in a new high-density version that allows three hairs to be implanted with each implant. The high-density version fibre is used on the crown area only. For the frontal hairline, single Biofibre® is suggested. [1]

It is important to remember that the success of the procedure depends on the following [8]:

- Safety of the fibres
- Use of the correct implant instruments
- Trained doctors
- Patient selection
- Post procedure care

## HAIR IMPLANT MATERIALS AND DEVICES

Table 5.1 - Hair Implant Materials and Devices by Medicap

Product	Available colour	Available shapes	Available length	Use
<b>Biofibre®</b>	<ul style="list-style-type: none"> <li>3 different colours</li> <li>White</li> </ul>	<ul style="list-style-type: none"> <li>Straight</li> <li>Wavy</li> <li>Curly</li> <li>Affro</li> </ul>	<ul style="list-style-type: none"> <li>1 cm</li> <li>30cm</li> <li>45cm</li> </ul>	<ul style="list-style-type: none"> <li>A safe and effective medical device for Alopecia</li> </ul>
<b>Medicap High Density®</b> [M.H.D.] Biocompatible Artificial Hair for implant	<ul style="list-style-type: none"> <li>3 different colours</li> <li>White</li> </ul>			<ul style="list-style-type: none"> <li>Offers a triple hair density outside the scalp just implanting a single fibre</li> <li>This product was developed to:                             <ul style="list-style-type: none"> <li>Minimize the implantation time</li> <li>Reduce number of implants and implant sessions</li> <li>Achieve the maximum volume with the smallest number of implants</li> </ul> </li> </ul>
<b>Automatic Biofibre Hair Implant®</b> device for artificial hair implant				<ul style="list-style-type: none"> <li>Device created to provide orientation to the procedure</li> <li>Perform correct implant depth with maximum fixation rate</li> </ul>
<b>Adjustable Implanter®</b> handle Implant Instrument				<ul style="list-style-type: none"> <li>Projected to provide the best hair implant precision and implant comfort for the physician</li> <li>A spare part of the Automatic Device</li> </ul>

## INDICATIONS

The use of hair implants is a hair restoration technique indicated to treat the following:

- Androgenic alopecia
- General hair thinning
- Depletion of a donor area for hair transplant
- Scalp scars
- Scalp burns
- As an addition to other hair restoration techniques

Hair implants can also be used when an immediate aesthetic result and a density of hair is required. This procedure is also an option when the patient asks for a soft surgery without hospitalization. It is indicated for male and female patients.

[9,10,11]



## ADVANTAGES AND DISADVANTAGES OF HAIR IMPLANTS

Table 5.2: Advantages and disadvantages of hair implants

<b>Advantages of using hair implants</b>	<ul style="list-style-type: none"> <li>▪ It is a reversible outpatient procedure</li> <li>▪ It is a soft surgery technique</li> <li>▪ Immediate results</li> <li>▪ Provides immediate psychological comfort for the patient</li> <li>▪ No patient downtime is required</li> <li>▪ Increases the hair density in a few hours [800 hairs/ hour]</li> <li>▪ Provides a gradual and progressive hair thickening</li> <li>▪ The implanted hair does not age</li> <li>▪ The implant procedure can be performed alone or in combination with other medical or surgical treatments</li> </ul>
<b>Disadvantages of using hair implants</b>	<ul style="list-style-type: none"> <li>▪ Small re-implants are needed from time to time to maintain the aesthetic result</li> <li>▪ The hair does not grow</li> <li>▪ It needs a suitable hygiene of the scalp and respect of after care</li> <li>▪ It is not recommended for patients sensitive to the pre-implant test</li> <li>▪ It is not recommended in patients suffering from scalp diseases or other conditions such as diabetes, lupus, HIV, hepatitis, autoimmune diseases</li> <li>▪ The procedure is not indicated for use on the temple area, on low frontal hairline, or areas with very thin dermal tissue [such as the sideburns] or in case of pathologically atrophic scalp</li> </ul>

### PRE-IMPLANT PROCEDURE CARE

Preventive measures begin by taking a careful history of the patient and physical exam of the entire scalp and the area to be implanted. Patient's expectations should be accessed and clarified. Obtaining Informed consent is mandatory.

Before the procedure takes place, a tolerance implant test should be performed. The implantation of 100 fibres should be carried out in one area chosen by the physician and a careful evaluation of the results should be completed 4 weeks after this procedure has taken place.

Blood tests should be performed and should include:

- Complete Blood Count
- Urea
- Creatinine
- Bilirubin [Total And Direct]
- Gamma-glutamyl transferase [GGT]
- Alanine aminotransferase [ALT]
- Aspartate aminotransferase [AST]
- Fibrinogen
- Treponema pallidum haem agglutination [TPH]
- Anti-HIV
- Hepatitis A-B and C Markers/Hbsag
- ESR [Erythrocyte Sedimentation Rate]
- Venereal disease research laboratory [VDRL]
- Prothrombin time [PT]
- Partial thromboplastin time [PTT]
- C Reactive Protein
- Fasting Blood Sugar Levels
- Serum Protein
- Electrophoresis
- Urinalysis
- Electrocardiogram

### THE HAIR IMPLANTATION PROCEDURE

The procedure is performed with local anaesthesia and allows the implant of 600 fibres per hour. The implant technique is performed with small hooking needles that go out to the implanter and hook the fibres root placing them under the scalp at galea level.

The average number of fibres implanted per session is around 1000 and the fibres should be implanted within a distance of 2 mm and with an inclination of 45 degrees. If the procedure is performed with the Automatic hair implant device, there is a

reduction of the operation time with minimization of trauma and enhancement of implant precision. [1,8]



Fig. 5.1. Automatic Biofibre® hair Implant Device

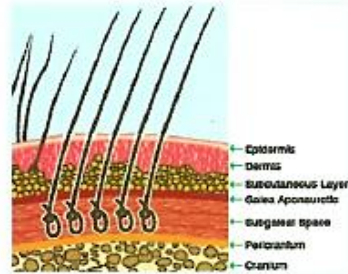


Fig 5.2. Right implant deepness



Fig. 5.3 Male patient implanted with 5000 Biofibre® in 5 sessions  
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## POST-IMPLANT PROTOCOL CARE

The use of systemic antibiotics are recommended for one week after the procedure. The most appropriate drug can be recommended by the treating physician according to his preference and the patient's medical history.

The home use of betadine and saline spray for three days is recommended as well as the use of ketaconazole shampoo for washing the scalp. Other chemical products or treatments

as hair bleaching, permanent waving, thermal shocks and hair curler should not be used [12]. Periodic medical check ups are necessary. The hair should not be cut for 2 weeks after the implant procedure to avoid risk of infection.

## COMPLICATIONS

Complications may occur and they include:

- Infection
- Inflammation
- Early excessive fibre loss
- Frizzing/damage of the quality of the fibres



Fig. 5.4. Local infection and inflammation after hair implantation

## COMPLICATIONS MANAGEMENT

The majority of complications can be resolved with appropriate therapies, such as steroids and antibiotics and a change in hygiene habits. The implanted fibres can also be removed.

The reversible knot of Biofibre does not allow the fibre to fall out but it can be entirely removed with the appropriate traction technique. [10,13,14]





**Fig. 5.5.** Reversible knot of Biofibre® after extraction. No residues stay embedded in the scalp allowing prompt scalp healing.

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## SAFETY, EFFECTIVENESS AND TOLERABILITY

Serdey et al, evaluated the safety and effectiveness of Biofibre hair implants in a group of 133 patients. Ninety-eight male patients and 38 female patients with alopecia underwent the procedure. All of them had a healthy scalp, good hygiene habits and a good state of health.

The most represented group, consisted of men between the ages of 30 and 60 that belonged to a scale of Hamilton of III to IV. These patients received up to 6000 fibres [average of 5-6 implants procedure over 3 years]. The researchers performed a clinical evaluation after 1 month, 4 months and every 4 other months after the procedure. Safety and effectiveness was evaluated in each patient.

The results of the study showed that the fibre loss was no more than 10% per year in 91.4% of the cases, 15% in 7.8% of the cases and 20% in 0.8% of the cases.

Regarding post implant complications and tolerability, 90,3%

of patients presented no complications, 5.9% presented mild infection and 3.8% presented inflammation.

The complications were resolved in 97.9% of the cases on an average of 15 days with the use of systemic antibiotics and/or local steroid therapy. The researchers reported that in 2.1% of cases, it was necessary to remove the fibres. The removal procedure was successful and left no scars. Only 3.8% of patients declared that they were not satisfied with the procedure while 96,2% declared that they were satisfied.

The tolerability of the procedure was evaluated through a histological evaluation in 4 patients. A punch biopsy of 5 mm was performed after 30 days of the implant of procedure, after 3,8,12 and 24 months. The histopathological findings were that until the 12th month there was a decrease of giant histiocyte cells around the fibres.

Fibroblasts increased inversely proportionally. Fibrosis increased until the 3rd month and remained unchanged until the 24th month. There was a proliferation of the epidermis; the artificial fibres were surrounded by hyperplastic epidermis at the level of the papillary layer of the dermis and in the uppermost part of the reticular dermis. At the deep dermis level and hypodermis, the fibres were surrounded by fibroplasia and no inflammatory infiltrate was observed. [15]

## HAIR IMPLANTS FOR THE TREATMENT OF SCARS

Scalp scars are often a challenging problem with significant psychosocial consequences. Scars rarely pose a health risk, but patients may present physical and aesthetic discomfort, social and psychological distress. [16]

Patients presenting burning scars may experience posttraumatic stress disorder due to the traumatic nature of the burn accident.

The causes of scalp scars are multiple and include: [17]

- Direct scalp trauma
- Local infection
- Burns
- Previous hair transplant surgeries [ flaps, donor site excision and scalp reduction], among others.

Santiago et al performed a study to assess the utility of artificial hair fibres to treat scalp scars. The researchers collected data from 44 patients with 54 scalp scars including 36 male patients and 8 female patients, with ages ranging between 17 and 64 years. They found no complications in 49 scars, mild adverse outcomes in 4 scars that resolved after use of topical corticosteroid and antibiotic treatment and moderately adverse outcomes in 1 scar that required the removal of the implant.

Some patients experienced minor skin reactions; seborrhea and sebum plugs that were controlled and the fibres fall rate found in this study was 20% on average annually. This study showed that Biofibre hair implants can be used as an adjunctive treatment for scalp scars. [10]



Fig. 5.6. Scalp scars treated with 1500 Biofibre® in 2 sessions  
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## QUALITY OF LIFE IMPROVEMENT AND PSYCHOSOCIAL IMPACT

Hair loss has a significant impact on the quality of life, psychological and social status of an individual. Patients may experience feelings of loss of self-confidence, low self-esteem, depression and anxiety. [18,19]

Female patients are particularly vulnerable to experiencing the psychosocial impact of hair loss and hair thinning. [18] These group of patients may benefit from hair implantation since the procedure offers immediate aesthetic result and psychological comfort to the patient. [20]

Alopecia totalis is a challenging disease with profound psychological impact to the patient and family members. [21] Although hair implantation is not considered the most appropriate treatment to alopecia totalis due the large number of hairs that need to be implanted and the possibility of complications, several cases were successfully treated. [21,22]

According to Ramos et al, the clinical results of these treatments were on average lower than the standard application in small areas, however the patients had an enormous psychological benefit. Additional studies and a development of a protocol to treat this specific group of patients are necessary.

It is also important to consider that the implant sessions should be performed with a 3-4 week interval, or according to medical indication. This interval between the sessions allow for a gradual change of image, adaptation to self-perception and a better psychological acceptance for the patient and other people. [19]





Fig. 5.7. Female patient implanted with 25.000 Biofibre® in 15 sessions

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## ADVANCES IN HAIR IMPLANTS

During the last decade, the quality of artificial hair implant fibres and implantation procedures have improved significantly. The hair implant Biofibre® is composed of a mixture of polyamides tested on clinical trials in laboratories accredited by the Italian Ministry of Health. This technique has multiple indications including the treatment of androgenic alopecia, general hair thinning, depletion of a donor area for hair transplant, scalp scars or scalp burns, amongst others.

Studies on the safety, effectiveness, tolerability of the product as well as quality of life improvement and psychosocial impact post procedure showed positive results.

Biofibre® Hair Implant is a soft surgery technique, performed under local anesthesia. This technique provides immediate aesthetic results, without patient down time whilst offering significant psychological comfort for the patient.

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