

What are the different types of sutures and how various suture materials are classified?

1. Absorbable and Non-absorbable suture materials

We can classify sutures into two types– those which are absorbable and will break down harmlessly in the body over time without intervention and those which are non-absorbable and must be manually removed if they are not left indefinitely. The type of suture used varies on the operation, with the major criteria being the demands of the location and environment and depends on the discretion and professional experience of the Surgeons.

Surgical sutures to be placed internally would require re-opening if they were to be removed. Suture materials which lie on the exterior of the body can be removed within minutes, and without re-opening the wound. As a result, absorbable sutures are often used internally; non-absorbable externally.

Certain Sutures may need to be placed in a stressful environment, for example the heart (constant pressure and movement) or the bladder (adverse chemical presence) may require specialized or stronger materials to perform their role; usually such sutures are either specially treated, or made of special materials, and are often non-absorbable to reduce the risk of degradation.

Types of Absorbable sutures include :

Polyglycolic Acid sutures, Polyglactin 910 , Catgut, Poliglecaprone 25 and Polydioxanone sutures.

Types of Non-Absorbable sutures include :

Polypropylene sutures, Nylon (polyamide), Polyester, PVDF, silk and stainless steel sutures.

2. Monofilament, Multifilament Sutures and Barb Sutures types

We can classify Suture materials on the basis of material structure i.e. monofilament sutures, multifilament or braided sutures and barb sutures (knotless monofilament sutures).

Braided sutures provide better knot security whereas monofilament sutures provide better passage through tissues. In general, Monofilament sutures elicit lower tissue reaction compared to braided sutures.

Multifilament sutures are braided and often coated with various materials like silicon, wax, PTFE, polycaprolactone, calcium stearate etc.

Barb sutures are monofilament sutures that have barbs or projections on the surface that can penetrate the tissues and hold them without necessitating the need for knots.

Monofilament sutures include:

Polypropylene sutures, Catgut, Nylon, PVDF, Stainless steel, Poliglecaprone and Polydioxanone sutures.

Multifilament or braided sutures include:

PGA sutures, Polyglactin 910, silk and polyester sutures.

Barb sutures are usually available in:

Polydioxanone, Poliglecaprone and polypropylene suture materials.

View [Suture Materials Chart](#) for properties of different suture materials.

3. Classification of sutures based on suture size

Surgical Sutures and ligatures are available in a number of sizes. Sutures are classified into different sizes based on the diameter of the thread. United States Pharmacopeia's classification of sutures into various sizes is widely accepted across the world.

The following U.S.P. and metric [suture sizes chart](#) shows the diameter range for collagen and synthetic sutures.

U.S.P. Size	COLLAGEN SUTURES		SYNTHETIC SUTURES	
	Metric Size	Diameter Range	Metric Size	Diameter Range
# 7	-	-	9	0.900 - 0.999
# 6	-	-	8	0.800 - 0.899
# 5	-	-	7	0.700 - 0.799
# 4	8	0.800 - 0.899	6	0.600 - 0.699
# 3	7	0.700 - 0.799	6	0.600 - 0.699
# 2	6	0.600 - 0.699	5	0.500 - 0.599
# 1	5	0.500 - 0.599	4	0.400 - 0.499
# 0	4	0.400 - 0.499	3.5	0.350 - 0.399
# 2-0	3.5	0.350 - 0.399	3	0.300 - 0.339
# 3-0	3	0.300 - 0.339	2	0.200 - 0.249
# 4-0	2	0.200 - 0.249	1.5	0.150 - 0.199
# 5-0	1.5	0.150 - 0.199	1	0.100 - 0.149
# 6-0	1	0.100 - 0.149	0.7	0.070 - 0.099
# 7-0	0.7	0.070 - 0.099	0.5	0.050 - 0.069
# 8-0	0.5	0.050 - 0.069	0.4	0.040 - 0.049
# 9-0	0.4	0.040 - 0.049	0.3	0.030 - 0.039
# 10-0	-	-	0.2	0.020 - 0.029

4. Synthetic and Natural Suture materials

Surgical sutures can also be divided into two types on the basis of raw material origin i.e. natural and synthetic sutures.

Natural sutures include silk and catgut sutures whereas all other sutures are synthetic in nature.

5. Types of sutures based on coatings – Coated and Un-Coated Sutures

Some types of sutures are available with specialized coatings on the surface to enhance properties like knotting, easy passage through tissue and reduce tissue reaction. Normally, coating is applied to braided sutures rather than monofilament sutures. It is easier to coat braided sutures compared to monofilaments. Coating materials like chromium salt, silicon, wax, PTFE, polycaprolactone, calcium stearate. Polymeric coating materials are known to be more bio-compatible than conventional coating materials like chromium salts, beeswax, paraffin, gelatin etc. There are new functional coatings like antibacterial or antimicrobial coating given to both monofilament and multifilament sutures, stem cell coating for improving healing properties. Antimicrobial coatings like chlorhexidine, triclosan, silver ion may be given to any suture as a surface coating in addition to the regular coating materials to reduce the incidence of surgical site infection and help wound healing.

Coated sutures include:

PGA sutures, Catgut Chromic, Polyglactin 910, silk and polyester sutures, braided or twisted nylon, Poliglecaprone and Polydioxanone sutures.

Un-coated sutures include:

Polypropylene sutures, Nylon, PVDF, Stainless steel and PTFE sutures.

6. Classification of different types of sutures based on usage

Sutures are also classified into various types based on the usage or application. We can classify sutures classified into general sutures, cardiovascular sutures, valve sutures, orthopaedic sutures, dental sutures, gynaec, veterinary sutures, cosmetic surgery sutures, ophthalmic sutures etc. A variety of suture materials may be used for a particular application based on the requirements. However, the suture sizes, length, needle profiles, etc., will be with a small change for a particular application.