

Absorbable Braided Suture Coated with Chlorhexidine Diacetate



Simulated picture, not real illustration. Artificial colours & effect.

#### About SSI: Surgical Site Infection. Facts & Figures

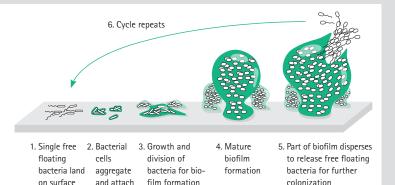
- Surgical site infection refers to an infection that occurs after surgery in the part of the body where the surgery took place. Surgical site infections can sometimes be superficial infections involving the skin only. Other surgical site infections are more serious and can involve tissues under the skin, organs, or implanted material (1).
- It occurs within 30 days after the operation if no implant is left in place or within 90 days if implant is in place. There are three types of SSIs: superficial incisional (involves only skin and subcutaneous tissue of the incision); deep incisional (involves deep soft tissue, e.g. fascia, muscle); and organ/space (involves any part of the anatomy, e.g. organs and spaces) (2).
- The World Health Organization shows that SSI is the most surveyed and frequent type of HAI (Hospital Acquired Infection) in low- and middle-income countries.
   Although SSI incidence is lower in high-income countries, it remains the second most frequent type of HAI in Europe and the US (3).
- Infections acquired in hospital are recognized as being associated with significant morbidity. They result in extended length of hospital stay, pain, discomfort and sometimes prolonged or permanent disability (3).
- Sutures can be a source of surgical wound contamination due to bacterial adherence and colonization. Sutures impregnated or coated with antimicrobial agents have been developed in an attempt to reduce bacterial adherence and colonization of suture materials (4, 5).



#### Absorbable Braided Suture Coated with Chlorhexidine Diacetate

Novosyn® CHD is indicated for use in applications where surgical practice requires the use of synthetic, absorbable,

braided suture materials, particularly in soft tissue approximation and/or ligation (6).



A biofilm plays a significant role in both device-related and tissue-based infections. Biofilm allows bacteria to survive intrinsic and extrinsic defenses that would inactivate the dispersed bacteria. The ideal method to manage a biofilm-mediated surgical site wound infection is to prevent it from occurring through rational use of antibiotic prophylaxis, adequate skin antisepsis prior to surgery and use of innovative in-situ irrigation procedures; together with antimicrobial suture technology. Once established, biofilm removal remains a significant clinical problem (7).

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# 1.5% Laparoscopic cholecystectomy/ 3.9% Open cholecystectomy 6.4% Laparoscopic colon surgery/ 10.1% Open colon surgery 2.2% Cesarean section 1.1% Hip prosthesis 0.6% Knee prosthesis 0.7% Laminectomy

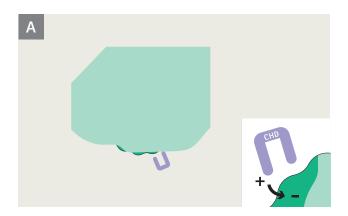
#### SSI pathogens (8)

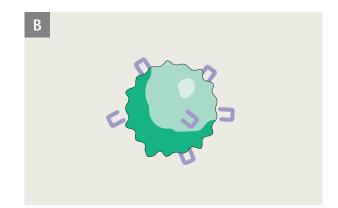
30.7% Gram-positive cocci in laparoscopic cholecystectomy38.5% Gram-positive cocci in open cholecystectomy

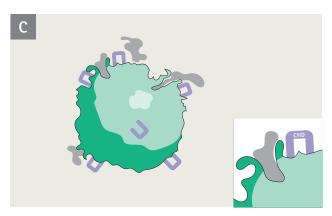
26.7% Gram-positive cocci in laparoscopic colon surgery

31.4% Gram-positive cocci in open colon surgery

52.5% Gram-positive cocci in cesarean section



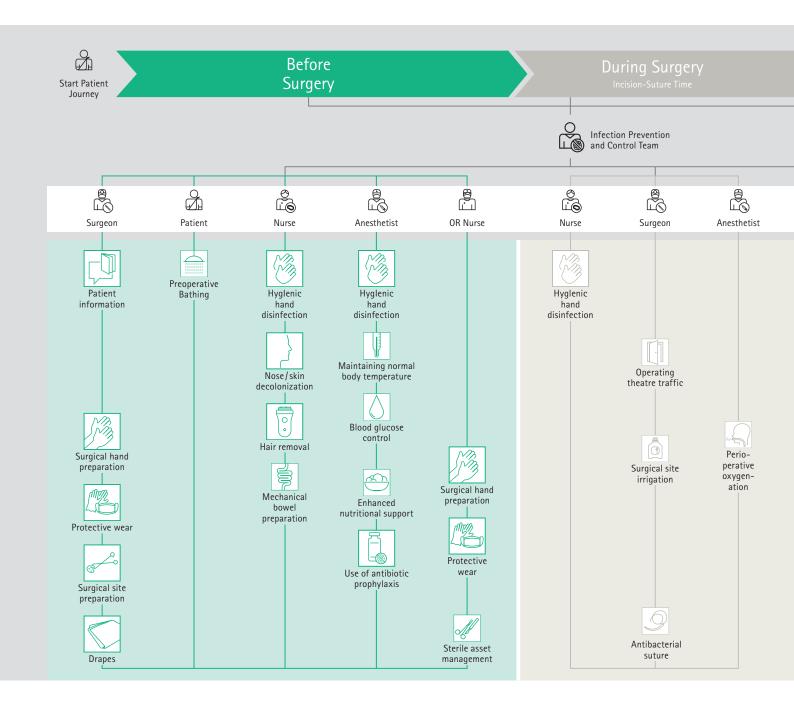


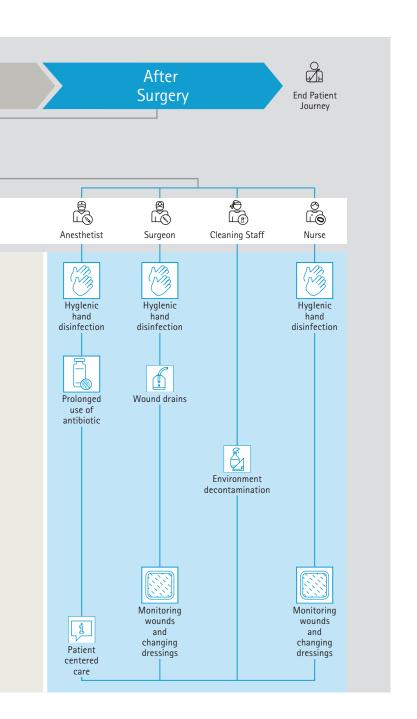


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Chlorhexidine's mode of action is to damage the permeability of the bacteria cell by disrupting the permeability barrier and blocking the transportation of electron in the cytochrome system by combining with the cytoplasmic membrane (9, 10).

- The rapid electrostatic attraction of the cationic positively chlorhexidine molecule and the negatively charged bacterial cell, contributes to the absorption to certain phosphate-containing compounds on the bacterial surface.
- Overcoming the bacterial cell wall exclusion mechanisms and attraction toward the cytoplasmic membrane.
- Leakage of cytoplasmic contents starting with low molecular weigh molecules typified by potassium ions.





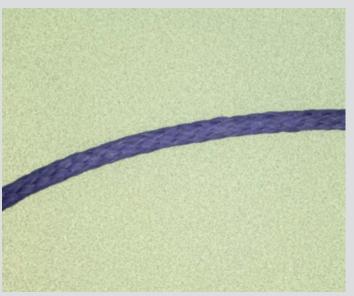
# Prevention

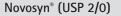
of Complications is

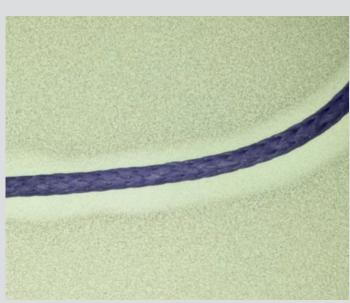
Better than the Cure

#### Absorbable Braided Suture Coated with Chlorhexidine Diacetate

## Zone of Inhibition







Novosyn® CHD (USP 2/0)

Novosyn® CHD has a zone of inhibition against the most common pathogens that causes SSI including *Staphylococcus aureus*, methicillin-resistant *Staphylococcus aureus* (MRSA), *Staphylococcus epidermidis*, methicillin-resistant *Staphylococcus epidermidis* (MRSE) (11–14).

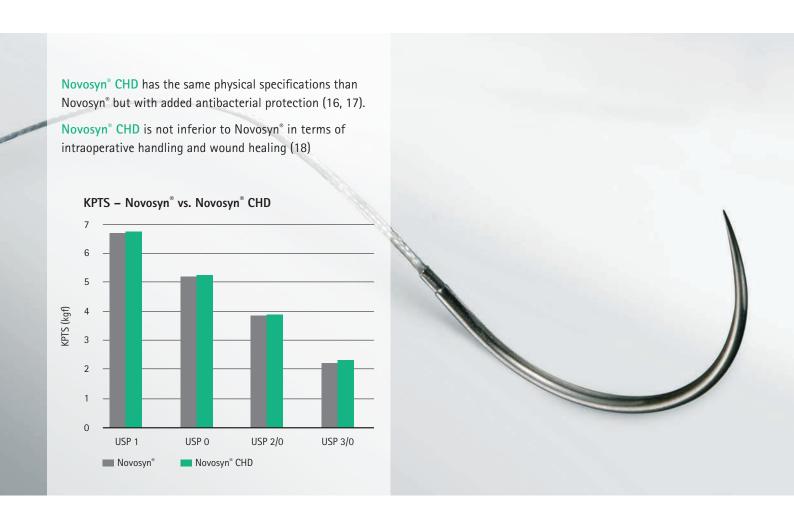
Novosyn® CHD helps on the prevention of microbial contamination of the implanted thread (11–14).

Product Features	Novosyn®	Novosyn° CHD
Structure	Multifilament braided and coated suture	Multifilament braided and coated suture
Material	Polyglactin 910	Polyglactin 910
Coating	Polyglactin 370 + Calcium stearate	Polyglactin 370 + Calcium stearate + Chlorhexidine diacetate
USP range	8/0 to 2	5/0 to 2
Colour	Undyed and violet	Undyed and violet
Indications	Soft tissue approximation and/or ligation, specially in the region of the gastro-intestinal tract, in gynecology, urology also indicated for ophthalmology and for microsurgery	Soft tissue approximation and/or ligation
Contra indications	When a prolonged support of the wound closure by the suture material is required	Ophthalmic, cardiovascular and neurological tissues and patients with known allergic reactions to Chlorhexidine diacetate and infants aged less than 2 months
Sterilization process	Ethylene oxide	Ethylene oxide
Tensile strentgh retention	After 1 day: 100 % After 14 days: 75 % After 21 days: 40–50 % After 28 days: 25 %	After 1 day: 100 % After 14 days: 75 % After 21 days: 40–50 % After 28 days: 25 %
Antibacterial effect	No	Chlorhexidine diacetate bactericidal effect is a result of the binding of this cationic molecule to negatively charged bacterial cell walls
Mass absorption	After 56 till 70 days	After 56 till 70 days

Novosyn® CHD has the same physical properties than Novosyn® but with added antibacterial protection (15).

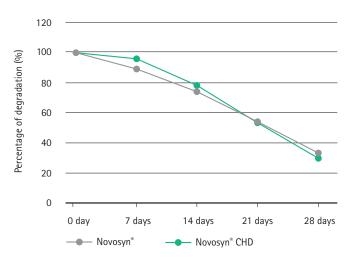


#### Absorbable Braided Suture Coated with Chlorhexidine Diacetate



### Degradation Profile Novosyn® vs Novosyn® CHD in NaCl 0.9% (USP 1, 0, 2/0, 3/0) (18, 19)

Same degradation profile as with Novosyn® (19, 20)



length		-1-							
		5/0	4/0	3/0	2/0	0	1	2	3
mm		(1)	(1.5)	(2)	(3)	(3.5)	(4)	(5)	(6)
3/8 circle round bodied needle									
DR 12	70		C1068436						
Easyslide	violet		C1000+30						
DR 18									
	70		C1068150	C1068151					
Easyslide	violet								
DR 22	70			C1068160					
Easyslide	violet								
\ DR 26 /	70				04000405				
Easyslide	70 violet				C1068165				
DR 32	violet								
DR 32	70			C1068170	C1068171	C1068172	C1068173		
Easyslide	violet			C1000170	C1000171	C1000172	C1000173		
1/2 circle round bodied needle									
1/2 circle round doubted recede	70	C1000007	C10C0000						
HR 13	70 violet	C1068007	C1068008						
• /	70	C1069007							
Easyslide	undyed								
HR 13ss									
• ,	70					C1068111			
Easyslide	violet								
HR 17	70	C1068012	C1068013	C1068014	C1068015				
( IN 17 )	violet	0	0						
Easyslide	70	C1069012	C1069013	C1069014					
Casysine	undyed 4 x 45		C1088713	C1088714					
HR 17	8 x 45		M1088185	21000/14					
(•)	8 x 70		M1088255						
Easyslide take off	violet								
HR 17s									
	70					C1068116	C1068118		
Easyslide	violet			C100022E					
UD 22	45 70		C1068029	C1088325 C1068030	C1068031				
HR 22	violet		21000020	21000000	21000001				
	70		C1069029						
Easyslide	undyed								
HR 22	4 x 45		C1088729	C1088730	C1088731				
	8 x 45		M1088177	M1088178					
(Easyslide) take off	4 x 70		C1088629	C1088630					
take off	violet								

C Box of 36 units	<b>B</b> Box of 24 units	<b>G</b> Box of 12 units	M Box of 6 units	

Needle	Thread				USP (r	netric)			
length	length cm	5/0 (1)	4/0	3/0	2/0	0	1	2	3
mm	colour	(1)	(1.5)	(2)	(3)	(3.5)	(4)	(5)	(6)
1/2 circle round bodied needle									
HR 22s									
•	70				C1068036	C1068037	C1068038		
Easyslide	violet								
HR 26	70	C1068039	C1068040	C1068041	G1068042	G1068043	C1068044		
•	90		C1068540	C1068541					
Easyslide	violet								
2xHR 26  Easyslide	90 violet			C1068901					
HR 26									
•	90				C1068542				
Easyslide	violet				0.0000.2				
2xHR 26  Easyslide	90 violet				C1068902				
I IID ac	90					C1068543	C1068544		
HR 26	violet								
	70			C1069041	C1069042				
Easyslide	undyed								
	4 x 45		144000470	C1088741	C1088742				
\ HR 26	8 x 45		M1088170	M1088171 B1088641	M1088172				
III 20	4 x 70 8 x 70			M1088239	B1088642 M1088241				
	violet			W1000233	W110002+1				
	8 x 45				M1089117				
Easyslide take off	undyed								
	70			C1068089	C1068090	C1068091	G1068092	C1068093	
HR 26s	90				C1068590	C1068591	C1068592	C1068613	
•	violet								
	70				C1069090	C1069091			
Easyslide	undyed								
HR 26s	4 x 45				C1088790	B1088791	B1088792	B1088793	
• /	4 x 70					B1088691	B1088692	B1088693	
Easyslide take off	violet								
HR 26ss							0		
•	70 90						C1068100 C1068580		
Easyslide	violet						C1068580		
Casysiac ·	violet								

	Needle		Thread				USP (r	netric)			
				5/0 (1)	4/0	3/0	2/0	0		2	3
	mm		colour	(1)	(1.5)	(2)	(3)	(3.5)	(4)	(5)	(6)
1/2 circle ro	ound bodied nee	dle									
	HR 30	,									
\		/	70			C1068046	C1068047	C1068048	C1068049	C1068045	
Easyslide	<b>、</b> ノ	_	90				C1068447				
Lasysiluc			violet								
\	HR 30	1									
		/	4 x 70				B1088661				
Easyslide		take off	violet								
	HR 30s	,									
\	•	/									
\		7	70					C1068548	C1068549		
Easyslide			violet								
	HR 30ss										
\	•										
E			90						B1068646		
Easyslide			violet								
1	HR 30ss										
			4 x 70						B1088803		
Easyslide		take off	violet						51000003		
	HR 37		70			C1068050	C1068051	C1068052	C1068053	C1068054	
\	IIN 37		90			C1068550	C1068551	B1068552	B1068553		
\	-		violet								
Ferrer			70				C1069051				
Easyslide	UD 07	_	undyed								
\	HR 37										
\	•		4 x 45				C1088770				
· Fameric			8 x 70				M1088219				
Easyslide		take off	violet						M1088138		
	UB 4 =		8 x 45 70			C1068094	C1068095	C1068096	C1068097	C1068098	
\	HR 37s		90			C1068955	C1068595	B1068956	B1068597	B1068598	
\	•		violet								
			70			C1069099	C1069095	C1069096			
			90				C1069595	B1069596	B1069597		
Easyslide			undyed								
\	HR 37s										
\	•		4 x 45			C1088794	C1088795	B1088796	B1088797	B1088798	
L Foortist			4 x 70						B1088697	B1088698	
Easyslide		take off	violet								

C Box of 36 units	B Box of 24 units	G Box of 12 units	M Box of 6 units
C DOX OF 30 UTILS	D DOX OF 24 UTILS	O DOX OF 12 UTILS	IVI DOX OF G UTILES

Needle	Thread				USP (r	netric)			
length		5/0	4/0	3/0	2/0	0		2	3
mm	colour	(1)	(1.5)	(2)	(3)	(3.5)	(4)	(5)	(6)
1/2 circle round bodied needle									
HR 37ss									
•	70						C1068123		
	90						B1068577		
Easyslide	violet						D1000077		
	70				C1068055	C1068056	C1068057	C1068058	
HR 40s	90			C1068466	C1068467	G1068556	G1068557	B1068558	
•	120						B1068555		
	violet								
	90						B1069557	B1069558	
Easyslide	undyed								
HR 40s									
• /	8 x 45						M1088117	M1088118	
	4 x 70						B1088667	B1088668	
Easyslide take off									
HR 40s									
	150						B1068350		
Easyslide									
HR 43									
\ • /	70					C1000040	C1000047	C1000040	
	70 90					C1068946	C1068947 B1068847	C1068948 B1068848	
Easyslide	violet						D1000047	D1000040	
HR 48					0400000	0400004	0400000	0400000	
111/140	70				C1068060	C1068061	C1068062	C1068063	
	90 violet				C1068560	B1068561	B1068562	B1068563	
	90					B1069561	B1069562	B1069563	
Easyslide	undyed					D1009201	D1009502	D1009503	
HR 48									
	8 x 45						M1088103	M1088104	
Easyslide take off	violet								
HR 60									
	70						C1068066	C1068068	
Easyslide	violet								

Needle	Thread				USP (r	netric)			
length		5/0 (1)	4/0	3/0	2/0	0	1	2	3
mm	colour	(1)	(1.5)	(2)	(3)	(3.5)	(4)	(5)	(6)
1/2 circle round bodied needle									
HR 60									
•									
Easyslide	150 violet						B1068380		
HR 65	violet								
•									
	90							B1068640	
Easyslide	violet								
HR 70									
Easyslide	70 violet						B1068183		
HR 76	VIOLE								
•									
	70				B1068074				
	90				B1000074		B1068579		
Easyslide	violet								
5/8 circle round bodied needle									
FR 26	70				01000445	01000440	01000417		
Easyslide	70 violet				C1068415	C1068416	C1068417		
2xFR 26									
( • Jí					04000000	0400			
Easyslide	90 violet				C1068820	C1068828			
FR 36									
( • )	70				C1068425	C1068426			
Easyslide	violet								
FR 40									
( - )	70					C1068490			
Easystide	violet								

C Box of 36 units	<b>B</b> Box of 24 units	<b>G</b> Box of 12 units	M Box of 6 units	

Needle	Thread				USP (r	metric)			
length mm		5/0 (1)	4/0 (1.5)	3/0 (2)	2/0 (3)	0 (3.5)	(4)	2 (5)	3 (6)
Hook round bodied needle		(1)	(1.5)	(2)	(3)	(3.3)	(.)	(3)	(0)
Hook round dodled needle									
JR 30									
	70				C1068475				
Easyslide	violet								
JR 36ss									
Easyslide	70 violet					C1068408			
<u>Carpsine</u>	violet								
JR 40s									
Easyslide	70 violet						C1068478		
3/8 circle round bodied needle with she	ort cutting po	int							
DRC 18									
Easyslide	70 violet		C1068124	C1068128					
DRC 22	70			C1068827					
Easyslide	violet			C1000027					
DRC 26									
Easyslide	70				C1068131				
DRC 32	violet								
\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	70					C1068304			
Easyslide	violet								
1/2 circle round bodied needle with she	ort cutting po	int							
HRC 17 ⊗	70		C1068313	C1068314		C1068316	C1068081		
Easyslide	violet		C1000013	21000314		21000310	21000001		
HRC 22 /	70		C1068325	C1068326	C1068331				
Easyslide	violet		C1000323	C1000320					
HRC 26									
Easyslide	70 violet			C1068335	C1068336	C1068343			
HRC 26									
acksquare	4 x 45				C1088036				
Easyslide take off	violet								

Needle	Thread				USP (r	netric)			
length		5/0 (1)	4/0	3/0	2/0	0	1	2	3
mm		(1)	(1.5)	(2)	(3)	(3.5)	(4)	(5)	(6)
1/2 circle round bodied needle with sho	ort cutting po								
HRC 26s	70				C1068441				
₩ Θ	violet								
Easyslide	70						C1069444		
HRC 30	undyed								
\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \									
	70					C1068371			
(Easyslide)	violet								
HRC 37 ⊗	70					01000000			
	70 90			C1068139	C1068140	C1068362 B1068141	B1068142	G1068143	
Easyslide	violet			21000100	21000140	51000171	51000142	31000173	
HRC 37s									
$\Diamond$	70				C1068842	C1068843	C1068844		
	90					B1068895		B1068897	
Easyslide	violet								
HRC 40									
$\Diamond$									
	70					C1068909			
Easyslide	violet								
HRC 40s ⊗									
	70						C1068960		
Easyslide	violet								
HRC 43s ⊗									
	70						C1068627	C1068628	
	90						B1068982	B1068983	
Easyslide	violet								
HRC 48									
$\odot$									
	70					C1068963	C1068964		
Easyslide	90 violet					B1068573	B1068574	B1068575	
(N	violet								
HRC 48									
$\Psi$									
	150						D100007		
Easyslide	150 violet						B1068987		
100р	VIOICE	l		I		I			

C Box of 36 units	<b>B</b> Box of 24 units	<b>G</b> Box of 12 units	M Box of 6 units	

Needle	Thread				USP (r	netric)			
length	length cm	5/0	4/0	3/0	2/0	0		2	3
mm		(1)	(1.5)	(2)	(3)	(3.5)	(4)	(5)	(6)
Hook round bodied needle with short c	utting point								
JRC 30s									
⊕ ▮									
	70						C1068476		
Easyslide	violet								
1/2 circle round bodied needle with blu	nt point								
HRN 35									
$\circ$	70					C1068518			
	90					B1068618	B1068619		
Easyslide	violet								
HRN 40									
	90						B1068637		
Easyslide	violet								
HRN 50									
	00						D1000004		
Easyslide	90 violet						B1068664		
	VIOIEL								
3/8 circle reverse cutting needle									
DC 12	70		C1068508						
DS 12	violet	0	0						
	45	C1069207	C1069208						
Easyslide	undyed	C10C0212	C10C0212						
DC 10	45 70	C1068212 C1068512	C1068213 C1068513	C1068514					
DS 16	violet	C1000512	C1000313	C1000314					
	45		C1069213						
Easyslide	undyed								
	45	C1068219	C1068220	C1068221					
PC 4.0	70	C1068419	C1068420	C1068421	C1068422				
DS 19	violet								
\ ' \	45	C1069219	C1069220	C1069221					
	70	C1069419	C1069420	C1069421					
Easyslide	undyed								
DS 24	70		C1068234	G1068235	G1068236	G1068237			
\ <del>\</del>	violet		0406000	04000005	0400000				
Easyslide	70		C1069234	C1069235	C1069236				
Lasysinac	undyed								

Needle	Thread				USP (r	netric)			
length		5/0	4/0	3/0	2/0	0		2	3
mm	colour	(1)	(1.5)	(2)	(3)	(3.5)	(4)	(5)	(6)
3/8 circle reverse cutting needle									
DS 30	70			C1068246	C1068247	C1068248	C1068249		
\ <b>*</b> /	violet 70			C1069246	C1069247	C1069248			
Easyslide	undyed			C1003240	C1003247	C1003240			
1/2 circle reverse cutting needle									
HS 21									
( * )	45		C1068225						
Easyslide	violet								
	45			C1068230					
HS 23	70			C1068430	C1068431				
( * )	violet			0					
Easyslide	70 undyed			C1069430					
HS 23ss									
\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	4 x 45				C1089680				
Easyslide take off	undyed				C1000000				
HS 26	,								
\ <b>\</b>									
	70			C1068241	C1068242	C1068243			
Easyslide	violet				0	0			
HS 26s	70 violet				C1068290	C1068291			
( ' )	70				C1069290				
Easyslide	undyed								
HS 30									
( • )					0		0		
Easyslide	70 violet				C1068251	C1068252	C1068253		
HS 37	violet								
\									
	90			C1068494	G1068495	B1068496	B1068497	B1068498	
Easyslide	violet								
HS 37s					0400	0400	0400000	0400	
\ ' /	70 90				C1068294 C1068596	C1068296 B1068582	C1068297 B1068583	C1068298 B1068599	
Easyslide	violet				C1008596	D 1008382	51008583	צבכססטו ט	
HS 37s + HR 37s ▼									
	150				B1068278				
Easyslide	violet				51000270				
				1		1			

C Box of 36 units	B Box of 24 units	<b>G</b> Box of 12 units	M Box of 6 units	
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Needle	Thread		USP (metric)						
length		5/0	4/0	3/0	2/0	0		2	3
mm		(1)	(1.5)	(2)	(3)	(3.5)	(4)	(5)	(6)
1/2 circle reverse cutting needle									
HS 37ss									
<del></del>									
	4 x 45					B1089718			
Easyslide take off	undyed								
HS 40 ▼									
	90					B1068486	B1068487	B1068488	
Easyslide	violet								
HS 40s									
\	70				C1000007	C1000000	C1000000		
	70 90				C1068267 C1068585	C1068268 B1068586	C1068269 G1068587	B1068588	
Easyslide	violet				C1000303	D1000300	01000307	D1000300	
HS 48	70					C1068261	C1068262		
▼	90					B1068461	G1068462	B1068463	
	violet								
	90						B1069363	B1069364	
Easyslide	undyed								
Straight reverse cutting needle									
Easyslide	70			C1068265	C1068266				
GS_60	violet								
<b>V</b>	70		C1069280	C1069265	C1069267				
	undyed								
3/8 circle reverse cutting needle with	precision poin	t							
DSMP 11	4.5	C1000000							
(Easyslide)	45 undyed	C1069608							
Casystate	45		C1068624						
DSMP 13	violet		2.00021						
<b>▼</b> /	45	C1069619	C1069620						
Easyslide	undyed								
DSMP 16									
	45	C1069525	C1069524						
Easyslide	undyed		0.000	0.000					
DSMP 19	45		C1069629	C1069630	01000505				
Easyslide	70		C1069529	C1069530	C1069531				
	undyed			C1060050	C1060CF7				
DSMP 24	45 70			C1069656 C1069556	C1069657 C1069554				
Easyslide	undyed			C1009330	C1009554				
	unayeu								

	Thread				USP (r	metric)			
		5/0	4/0	3/0	2/0	0	1	2	3
	colour	(1)	(1.5)	(2)	(3)	(3.5)	(4)	(5)	(6)
Pre-cut sutures									
3 threads of 45 cm	3 x 45		C1058624	C1058625	C1058626	C1058627	C1058629	C1058630	
	violet								
6 threads of 45 cm	6 x 45		C1058644	C1058645	C1058646	B1058647	B1058649	B1058650	
	violet								
12 threads of 45 cm	12 x 45		C1058664	C1058665	C1058666	B1058667	B1058669	B1058670	
	violet								
2 threads of 70 cm	2 x 70			C1058405	C1058406	C1058407	C1058409	C1058410	
	violet								
5 threads of 70 cm	5 x 70		C1058444	C1058445	C1058446	C1058447	B1058449	B1058450	
	violet								
1 thread of 140 cm	1 x 140		C1058204	C1058205	G1058207	C1058208	C1058209	C1058210	
	violet								
3 threads of 45 cm	3 x 45			C1059625	C1059626				
	undyed								
6 threads of 45 cm	6 x 45			C1059645	C1059646				
	undyed								
12 threads of 45 cm	12 x 45			C1059665	C1059666				
	undyed								
5 threads of 70 cm	5 x 70				C1059446	C1059447	B1059449		
	undyed								
1 thread of 140 cm	1 x 140			C1059205	C1059207	C1059208			
	undyed								
Ligature reels									
1 thread of 250 cm	1 x 250			G1058715	G1058716	G1058717	G1058719	G1058720	
	violet								

C Box of 36 units B Box of 24 units G Box of 12 units M Box of 6 units
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#### Absorbable Braided Suture Coated with Chlorhexidine Diacetate

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