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**Dr. Akansha Sharma**  
Post-Graduate, Department of  
Periodontology, Subharti Dental  
College and Hospital, Swami  
Vivekanand Subharti  
University, Meerut,  
Uttar Pradesh, India

**Dr. Amit Wadhawan**  
Professor, Department of  
Periodontology, Subharti Dental  
College and Hospital, Swami  
Vivekanand Subharti  
University, Meerut,  
Uttar Pradesh, India

**Dr. Chander Shekhar Joshi**  
(1) Professor, Department of  
Periodontology, DJ College of  
Dental Sciences and Research,  
Modinagar, Uttar Pradesh, India  
(2) Ex-Reader, Department of  
Periodontology, Subharti Dental  
College and Hospital, Swami  
Vivekanand Subharti  
University, Meerut,  
Uttar Pradesh, India

**Dr. Mayur Kaushik**  
Professor and Head, Department  
of Periodontology, Subharti  
Dental College and Hospital,  
Swami Vivekanand Subharti  
University, Meerut,  
Uttar Pradesh, India

**Corresponding Author:**  
**Dr. Akansha Sharma**  
Post-Graduate, Department of  
Periodontology, Subharti Dental  
College and Hospital, Swami  
Vivekanand Subharti  
University, Meerut,  
Uttar Pradesh, India

## Coronally advanced flap design in management of isolated gingival recession: A case series

**Dr. Akansha Sharma, Dr. Amit Wadhawan, Dr. Chander Shekhar Joshi and Dr. Mayur Kaushik**

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### Abstract

Coronally Advanced flap is one of the most common procedures that are done for recession coverage because of ease of doing and yielding good results as compared to other techniques. A total of 10 systemically stable participants, both males & females between the ages of 20-60 with recession defects in maxillary canines and premolar Clinical parameters were recorded at baseline, 1, 3 and 6 months including: GI, PI, PPD, CAL, RL, RW, WKG and % root coverage. At 6 months postoperative, 80% of the treated sites achieved 100% root coverage. Based on clinical results, Coronally advanced flap technique could be considered as one of the possible treatment options for isolated gingival recession with good esthetic and patient satisfaction.

**Keywords:** gingival recession, mucogingival surgical procedures, coronally advanced flap

### Introduction

Traditionally, periodontal treatment has focused on the prevention of disease and the preservation of a functional, healthy dentition and supporting tissues. However, in recent years, periodontal therapy, like dental therapy in general, has become increasingly focused on aesthetic outcomes for patients that go beyond tooth replacement and colour to include the soft tissue component. Gingival recession is defined as "marginal tissue displacement apical to cemento-enamel junction (CEJ)"<sup>[1]</sup>. Since the marginal tissue may have been alveolar mucosa, the word "marginal tissue recession" is considered more appropriate than "gingival recession"<sup>[2-3]</sup>. The term "periodontal plastic surgery" was introduced as "surgical procedure used to correct or eliminate anatomic, developmental or traumatic deformities of the gingiva and alveolar mucosa"<sup>[4]</sup>. The goal of periodontal plastic surgery was to replace missing tissue up to the cemento-enamel junction and to restore a natural, healthy gingival sulcus<sup>[5]</sup>.

Coronally Advanced Flap (CAF) is a predictable mucogingival surgical procedure used to achieve root coverage in the treatment of Miller's Class I and Class II gingival recessions. Best clinical outcomes in terms of root coverage are reported when flap is passively adapted to the exposed root surface and the gingival margin is positioned at the cemento-enamel junction (CEJ)<sup>[6]</sup>. Few anatomical variations like root prominence, presence of frenum, type of periodontium, recession depth and vestibular depth may influence the shift of coronally advanced flap towards the CEJ<sup>[7]</sup>. Coronally positioned flap was first introduced by Norberg and was described by Mutschelknauss, Restrepo, but other researchers (Nordenram, Harvey, Nordenram and Landt) also employed surgical techniques in cases of marginal periodontitis to cover denuded roots by coronal repositioning of mucoperiosteal flaps<sup>[8]</sup>.

### Material and Methods

The study included 10 patients who were 20-40 years were recruited from the outpatient department of Periodontics of Subharti Dental College and Hospital in Meerut, India. The exclusion Criteria were: 1) Class III, or Class IV gingival recession, 2) Gingival thickness less than 1.5 mm, 3) Patients with history of allergic reactions, 4) Presence of severe cervical abrasion/root caries that would require restoration, 5) Pregnant and lactating patients, 6) Smokers. After initial screening consultation, Phase I therapy was instituted to obtain optimal plaque control. Clinical parameters were recorded at different time intervals (at baseline, 1, 3 and 6 months) including: Plaque Index (PI)<sup>[9]</sup>, Gingival Index (GI)<sup>[10]</sup>, Pocket Probing

Depth (PPD), Width of Keratinized Gingiva (WKG), Clinical Attachment Level (CAL), Recession Length (RL), Recession Width (RW) and Root coverage percentage.

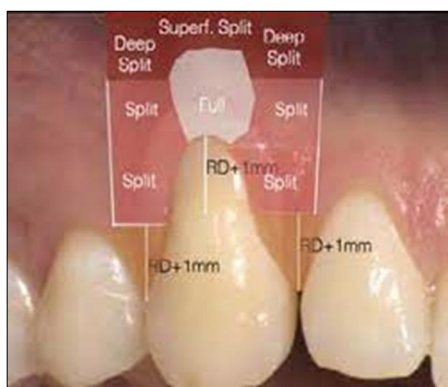
**Surgical procedure**

At the surgical site, adequate anaesthesia was obtained with 2 percent lignocaine HCl containing 1:20, 000 adrenaline (Shown in fig. 2, 7). Prior to the procedure gingival thickness was measured, placing the UNC-15 probe and the stopper perpendicular to the long axis of the tooth hitting the bone. Using modified coronally advanced flap technique (Zucchelli and De-Sanctis) (Shown in fig. 1) two oblique slightly divergent beveled incisions were given at the mesial and distal line angles of the tooth. After intrasulcular incisions, crossed submarginal interproximal incisions were given (Shown in fig. 4). The split thickness flap was then raised in the coronal-apical direction from the oblique interdental incisions. At middle 3rd a full thickness mucoperiosteal flap was elevated (Shown in fig. 5). This helps to allow the flap to move coronally without tension. Gracey instruments were used to thoroughly mechanically decontaminate previously exposed root surfaces in the oral cavity. The flap was then coronally advanced and then fixed by 5-0 polyglactin-910 resorbable sling sutures at the interdental area and simple interrupted sutures were given to accomplish a precise adaptation around teeth (Shown in fig. 6).

**Results**

The mean difference in gingival index, plaque index and pocket probing depth was statistically non-significant ( $P > 0.05$ ) on applying Paired 't' test at 0-1 month, 1-3 months, 3-6 months and 0-6 months respectively. A non-significant difference ( $P > 0.05$ ) was present between different time intervals (i.e., 0-1 month, 1-3 months, 3-6 months and 0-6 months) when unpaired 't' test was applied for the inter group comparison (Shown in Table. 1-3).

The mean difference in clinical attachment level, width of keratinized gingiva, recession length and recession width was statistically significant ( $P < 0.05$ ) on applying Paired 't' test at 0-1 month, 1-3 months, 3-6 months and 0-6 month respectively. A non-significant difference ( $P > 0.05$ ) was present between different time intervals (i.e., 0-1 month, 1-3 months, 3-6 months and 0-6 months) when unpaired 't' test was applied for the inter group comparison. The mean difference in percentage root coverage was statistically significant ( $P < 0.05$ ) on applying Paired 't' test at 0-1 month, 1-3 months, 3-6 months and 0-6 month. A non-significant difference ( $P > 0.05$ ) was present between different time intervals (i.e., 0-1 month, 1-3 months, 3-6 months and 0-6 months) when unpaired 't' test was applied for the inter group comparison (shown in Table. 4-9). The percentage improvement from base to 6 months was 96.28% (Shown in fig. 3, 8).



**Fig 1:** Coronally advanced flap demonstration



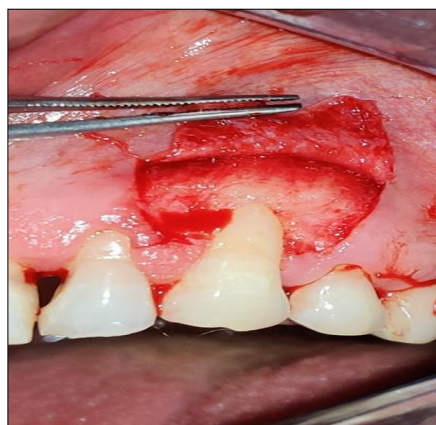
**Fig 2:** Case 1; Preoperative – isolated Miller's class II recession in relation to 23



**Fig 3:** Case 1; 6 months postoperative – isolated Miller's class II recession in relation to 23



**Fig 4:** Vertical and horizontal incisions given



**Fig 5:** Flap reflected



**Fig 6:** Coronally advanced flap and sutures given



**Fig 7:** Case 2; Preoperative – isolated Miller's class II recession in relation to 13



**Fig 8:** Case 2; 6 months postoperative – isolated Miller's class II recession in relation to 13

**Table 1:** Mean, standard deviation and standard error of mean of gingival scores at different time intervals and their differences between successive time intervals

S. No.	Time-Points				Differences			
	Base Line	1 Month	3 Months	6 Months	0-1	1-3	3-6	0-6
1	2.00	1.40	1.20	1.20	0.60	0.20	0.00	0.80
2	1.72	1.30	1.20	1.65	0.42	0.10	-0.45	0.07
3	1.60	1.30	1.30	0.98	0.30	0.00	0.32	0.62
4	2.00	1.50	1.20	0.97	0.50	0.30	0.23	1.03
5	1.80	1.30	1.20	1.57	0.50	0.10	-0.37	0.23
6	1.70	1.11	0.67	1.35	0.59	0.44	-0.68	0.35
7	1.60	0.80	0.65	1.30	0.80	0.15	-0.65	0.30
8	1.80	0.82	0.60	1.40	0.98	0.22	-0.80	0.40
9	2.00	1.70	0.35	1.30	0.30	1.35	-0.95	0.70
10	1.72	0.97	0.62	1.51	0.75	0.35	-0.89	0.21
MEAN	1.794	1.220	0.899	1.323	0.574	0.321	-0.424	0.471
S.D.	0.157	0.293	0.351	0.228	0.219	0.384	0.461	0.304
SEM	0.050	0.093	0.111	0.072	0.069	0.122	0.146	0.096

**Table 2:** Mean, standard deviation and standard error of mean of plaque index at different time intervals and their differences between successive time intervals

S. No.	Base Line	1 Month	3 Months	6 Months	0-1	1-3	3-6	0-6
1	1.98	1.01	0.50	1.85	0.97	0.51	-1.35	0.13
2	1.87	1.00	0.13	0.98	0.87	0.87	-0.85	0.89
3	1.66	0.91	0.17	1.51	0.75	0.74	-1.34	0.15
4	1.50	1.13	0.13	0.80	0.37	1.00	-0.67	0.70
5	1.62	1.00	0.15	1.50	0.62	0.85	-1.35	0.12
6	1.87	0.86	0.17	1.55	1.01	0.69	-1.38	0.32
7	1.77	1.00	0.12	1.65	0.77	0.88	-1.53	0.12
8	1.78	1.06	0.13	1.65	0.72	0.93	-1.52	0.13
9	1.61	0.76	0.11	1.45	0.85	0.65	-1.34	0.16
10	1.72	0.98	0.11	1.35	0.74	0.87	-1.24	0.37
MEAN	1.738	0.971	0.172	1.429	0.767	0.799	-1.257	0.309
S.D.	0.145	0.104	0.117	0.317	0.183	0.148	0.279	0.274
SEM	0.046	0.033	0.037	0.100	0.058	0.047	0.088	0.087

**Table 3:** Mean, standard deviation and standard error of mean of pocket probing depth at different time intervals and their differences between successive time intervals

S. No.	Base Line	1 Month	3 Months	6 Months	0-1	1-3	3-6	0-6
1	2	1	1	2	1	0	-1	0
2	2	1	1	1	1	0	0	1
3	2	1	1	2	1	0	-1	0
4	3	1	1	1	2	0	0	2
5	3	1	1	2	2	0	-1	1
6	3	1	1	1	2	0	0	2
7	1	1	1	1	0	0	0	0
8	2	1	1	1	1	0	0	1
9	1	1	1	1	0	0	0	0
10	1	1	1	1	0	0	0	0
MEAN	2.000	1.000	1.000	1.300	1.000	0.000	-0.300	0.700
S.D.	0.816	0.000	0.000	0.483	0.816	0.000	0.483	0.823
SEM	0.258	0.000	0.000	0.153	0.258	0.000	0.153	0.261

**Table 4:** Mean, standard deviation and standard error of mean of clinical attachment level at different time intervals and their differences between successive time intervals

S. No.	Base Line	1 Month	3 Months	6 Months	0-1	1-3	3-6	0-6
1	3.72	1.50	1.49	1.59	2.22	0.01	-0.10	2.13
2	2.88	1.24	1.52	1.86	1.64	-0.28	-0.34	1.02
3	3.60	1.00	1.50	1.10	2.60	-0.50	0.40	2.50
4	5.60	2.00	1.30	1.60	3.60	0.70	-0.30	4.00
5	3.63	1.00	1.60	1.12	2.63	-0.60	0.48	2.51
6	3.00	1.00	1.05	1.16	2.00	-0.05	-0.11	1.84
7	2.87	1.20	1.00	1.40	1.67	0.20	-0.40	1.47
8	3.70	1.08	1.50	1.60	2.62	-0.42	-0.10	2.10
9	3.41	1.07	1.25	1.30	2.34	-0.18	-0.05	2.11
10	3.98	1.87	1.77	1.97	2.11	0.10	-0.20	2.01
MEAN	3.639	1.296	1.398	1.470	2.343	-0.102	-0.072	2.169
S.D.	0.789	0.371	0.244	0.305	0.571	0.385	0.294	0.784
SEM	0.250	0.117	0.077	0.097	0.181	0.122	0.093	0.248

**Table 5:** Mean, standard deviation and standard error of mean of width of keratinized gingiva at different time intervals and their differences between successive time intervals

S. No.	Base Line	1 Month	3 Months	6 Months	0-1	1-3	3-6	0-6
1	2.55	5.70	5.23	2.30	-3.15	0.47	2.93	0.25
2	2.21	4.90	4.26	1.99	-2.69	0.64	2.27	0.22
3	2.34	4.88	5.10	2.22	-2.54	-0.22	2.88	0.12
4	2.54	5.46	4.30	2.00	-2.92	1.16	2.30	0.54
5	2.54	5.63	3.00	2.64	-3.09	2.63	0.36	-0.10
6	2.89	5.70	5.50	2.65	-2.81	0.20	2.85	0.24
7	2.45	5.02	5.10	2.25	-2.57	-0.08	2.85	0.20
8	2.67	4.98	4.40	2.55	-2.31	0.58	1.85	0.12
9	2.78	4.90	4.70	2.65	-2.12	0.20	2.05	0.13
10	2.54	4.50	2.67	2.45	-1.96	1.83	0.22	0.09
MEAN	2.551	5.167	4.426	2.370	-2.616	0.741	2.056	0.181
S.D.	0.198	0.421	0.940	0.256	0.398	0.896	1.005	0.162
SEM	0.063	0.133	0.297	0.081	0.126	0.283	0.318	0.051

**Table 6:** Mean, standard deviation and standard error of mean of recession length at different time intervals and their differences between successive time intervals

S. No.	Base Line	1 Month	3 Months	6 Months	0-1	1-3	3-6	0-6
1	2.18	0.10	0.15	2.50	2.08	-0.05	-2.35	-0.32
2	3.62	0.05	0.10	2.58	3.57	-0.05	-2.48	1.04
3	2.68	0.02	0.05	2.51	2.66	-0.03	-2.46	0.17
4	3.00	0.00	0.02	2.68	3.00	-0.02	-2.66	0.32
5	2.82	0.09	0.05	2.87	2.73	0.04	-2.82	-0.05
6	2.77	1.10	0.05	2.87	1.67	1.05	-2.82	-0.10
7	3.34	1.05	0.10	3.01	2.29	0.95	-2.91	0.33
8	4.34	0.90	0.10	3.48	3.44	0.80	-3.38	0.86
9	3.49	2.01	0.14	3.11	1.48	1.87	-2.97	0.38
10	3.56	1.10	0.18	3.36	2.46	0.92	-3.18	0.20
MEAN	3.180	0.642	0.094	2.897	2.538	0.548	-2.803	0.283
S.D.	0.613	0.689	0.052	0.345	0.691	0.666	0.327	0.416
SEM	0.194	0.218	0.016	0.109	0.219	0.211	0.103	0.132

**Table 7:** Mean, standard deviation and standard error of mean of recession width at different time intervals and their differences between successive time intervals in

S. No.	Base Line	1 Month	3 Months	6 Months	0-1	1-3	3-6	0-6
1	4.73	2.15	1.78	4.62	2.58	0.37	-2.84	0.11
2	4.38	0.36	0.79	4.30	4.02	-0.43	-3.51	0.08
3	4.51	0.45	1.00	4.28	4.06	-0.55	-3.28	0.23
4	3.33	0.78	1.80	2.78	2.55	-1.02	-0.98	0.55
5	2.64	0.45	0.56	2.11	2.19	-0.11	-1.55	0.53
6	2.29	0.00	0.54	2.00	2.29	-0.54	-1.46	0.29
7	3.80	1.00	1.35	3.21	2.80	-0.35	-1.86	0.59
8	5.08	3.50	1.85	4.91	1.58	1.65	-3.06	0.17
9	2.91	1.00	1.68	2.41	1.91	-0.68	-0.73	0.50
10	2.60	0.86	0.62	2.31	1.74	0.24	-1.69	0.29
MEAN	3.627	1.055	1.197	3.293	2.572	-0.142	-2.096	0.334
S.D.	1.007	1.034	0.554	1.128	0.863	0.755	0.995	0.193
SEM	0.319	0.327	0.175	0.357	0.273	0.239	0.315	0.061

**Table 8:** Mean, standard deviation and standard error of mean of root coverage at different time intervals and their differences between successive time intervals

S. No.	Baseline	1 Month	3 Months	6 Months	0-1	1-3	3-6	0-6
1	80.516	82.81	88.02	78.69	-2.29	-5.21	9.33	1.83
2	83.375	85.75	87.31	75.63	-2.38	-1.56	11.68	7.75
3	78.591	80.83	87.77	74.32	-2.24	-6.94	13.45	4.27
4	83.9	86.29	86.64	71.32	-2.39	-0.35	15.32	12.58
5	82.208	84.55	87.67	71.22	-2.34	-3.12	16.45	10.99
6	83.647	86.03	87.51	72.33	-2.38	-1.48	15.18	11.32
7	84.153	86.55	86.06	84.33	-2.40	0.49	1.73	-0.18
8	82.286	84.63	87.25	82.22	-2.34	-2.62	5.03	0.07
9	80.925	83.23	87.42	82.11	-2.31	-4.19	5.31	-1.19
10	71.26	73.29	87.95	88.57	-2.03	-14.66	-0.62	-17.31
MEAN	81.086	83.396	87.360	78.074	-2.310	-3.964	9.286	3.012
S.D.	3.872	3.983	0.605	6.044	0.110	4.375	6.098	8.813
SEM	1.225	1.260	0.192	1.913	0.035	1.384	1.930	2.789

**Table 9:** Showing the probable values of paired "t" test b/w successive time intervals for all parameters

S. No.	Parameters	Values			
		0-1	1-3	3-6	% Improvement
1	Gingival index	.0965* P>.05 (N.S.)	.1025* P>.05 (N.S.)	.0996* P>.05 (N.S.)	73.74%
2	Plaque index	.1124** P>.05 (N.S.)	.1020** P>.05 (N.S.)	.0987** P>.05 (N.S.)	82.22%
3	Probing pocket depth	.0985* P>.05 (N.S.)	1** P>.05 (N.S.)	1** P>.05 (N.S.)	65.00%
4	Clinical attachment level	.0000* P<.05 (SIG.)	.0041** P<.05 (SIG.)	.0048** P<.05 (SIG.)	43.85%
5	Width of keratinized gingiva	.0000* P<.05 (SIG.)	.0190* P<.05 (SIG.)	.0016* P<.05 (SIG.)	92.90%
6	Recession length	.0000* P<.05 (SIG.)	.0042* P<.05 (SIG.)	.0257* P<.05 (SIG.)	91.10%
7	Recession width	.0000* P<.05 (SIG.)	.0034** P<.05 (SIG.)	.0024** P<.05 (SIG.)	90.79%
8	Root coverage (%)	.0003* P<.05 (SIG.)	.0038* P<.05 (SIG.)	.0042* P<.05 (SIG.)	96.28%

\*Shows a significant difference b/w different time intervals at .05 level of significance. P<.05

\*\*Shows no significant difference b/w different time intervals at .05 level of significance. P>.05

## Discussion

The therapeutic goal in most cases of denuded roots is to restore the gingival unit at or near the cemento-enamel junction (CEJ) [11]. Periodontal plastic surgical graft (muco-gingival) techniques are used in the majority of these procedures, either alone or in conjunction with guided tissue regenerative procedures. The dimension most commonly assessed is the height the distance between the soft tissue margin and the muco-gingival line measured in millimetres. An increase in gingival height, independent of the numbers of millimetres, is considered to be a successful outcome of gingival augmentation procedures.

Zucchelli *et al.* [12] in his study on Coronally advanced flap with and without vertical releasing incisions for the treatment of multiple gingival recessions: a comparative controlled randomized clinical trial, showed the CAL gain of 1.44±0.49 in a 12 months of study. But according to the study done by Saletta *et al.* [13] on Coronally advanced flap procedure, the interdental papilla is a prognostic factor for root coverage. The study showed improvement in CAL to 3.92±1.05 mm from 1.20±0.59 mm at the end of six months. It was seen that the width of keratinized gingiva was decreased from 2.7±1.1

to 2.2±1.2 by 8 years in a study done by Prato *et al.* [14] on Long-term 8-year outcomes of coronally advanced flap for root coverage. In a study of Gurgan *et al.* [15] the achieved mean root coverage percentage was 94.80% at the end of three months and in his study on alterations in location of mucogingival junction 5 years after coronally repositioned flap surgery, he concluded that CAF procedure is effective in the treatment of gingival recessions.

In the present era of minimally invasive tech, many techniques are there to manage gingival recession defects in order to obtain better esthetics. While some of them are better for the management of isolated defects like VISTA technique, Saddle technique and MCAT technique etc., which are better for the coverage up to 3mm. But as per our experience in order to cover the large recession defect of more than 3mm, Coronally advanced flap technique that we have used in our study is the best treatment option as the vertical incisions that we have given allows improved visualization and access to the treated site by raising split-full-split thickness flap, which is a technique sensitive procedure and requires clinical expertise. Thus CAF plays an important role in future towards the success of the root coverage.

## Conclusion

Coronally Advanced flap is one of the most common procedure that is done for recession coverage because of ease of doing and yielding good results as compared to other techniques. Thus results of the present case demonstrated that the approach to the coronally advanced flap technique was very effective for the treatment of isolated gingival recessions in patients with esthetics demands both in terms of root coverage and increase in keratinized tissue.

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