

# The Development of Stop Clusters in As?okan Rock Edicts

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# The development of stop clusters in Aśokan Rock Edicts

Yasuko Suzuki

## Abstract

This paper examines the developments of the consonant clusters involving a stop or stops in Aśokan Rock Edicts. The original stop-final clusters with a stop preceded by another stop, *l* or a sibilant are affected by anticipatory assimilation (or loss of the first consonant) in all the six dialects examined in this paper with some residues of the sibilant-stop clusters found in the western dialects. The original stop-initial clusters with a stop followed by a sibilant or a nasal are affected either by perseverative assimilation (or loss of the sibilant or nasal), anticipatory assimilation (or loss of the stop), or vowel epenthesis, in addition to denasalization in the case of stop-nasal clusters, showing dialectal and phonological variations. Of the stop-sibilant and stop-nasal clusters, *kṣ* and *ḷñ*, which have undergone place assimilation in Old Indo-Aryan, show relatively uniform development in parallel with stop-final clusters. Other stop-initial clusters are variegated in their development. The tendencies observed in the assimilated outcomes are attributed to the dominance of the second consonant of the cluster and to the dominance of the stop articulation, at least the former of which is cross-linguistically observed in assimilation.

**Keywords:** Aśokan Rock Edicts, assimilation, consonant clusters, consonant changes, stops

## 1. Introduction

Middle Indo-Aryan is known for its extensive assimilation and cluster simplification, which is governed by the consonant hierarchy rather than by directionality (Mehendale 1948: xxiv; von Hinüber 2001: §226; Suzuki 2002b: 64; Bubenik 2003: 217–218; Oberlies 2003: 178; 2019: 147, 150–151). Among four major groups of consonants—stops, nasals, sibilants, and semivowels (i.e. approximants)—stops are the strongest and thus, except in the case of the homorganic nasal-stop clusters, assimilate the adjacent nasals, semivowels, and sibilants whether these precede or follow the stops (Pischel 1981: §§276–277, 301–311, 316–328; Masica 1991: 171–180; Geiger 1994: §51; von Hinüber 2001: §226; Suzuki 2002a, 2014: 12–14; Oberlies 2019: 150–151). Clusters of two distinct stops as well as those of two distinct nasals undergo anticipatory assimilation (Masica 1991: 176; Geiger 1994: §52; Oberlies 2019: 150). The original ‘stop clusters’ that are examined in this paper refer to those consonant clusters with at least one stop, which are

predicted to develop into stops by assimilation in Middle Indo-Aryan. Clusters of *r* and a stop in either order and clusters of a stop and *y*, which may involve place change by retroflexion and palatalization, respectively, are excluded from the discussions because they are treated elsewhere in Suzuki (2019a and 2019b).

To illustrate the changes of stop clusters in Middle Indo-Aryan, examples of Pali are given in (1) for the anticipatory assimilation of two distinct stops in (1a), of *l* followed by a stop in (1b), and of a sibilant followed by a stop in (1c); and for the perseverative assimilation of a sibilant preceded by a stop in (1d) and of a nasal preceded by a stop in (1e). In (1c) and (1d), the output stop is aspirated, which originates from the assimilated sibilant, even when the input stop is unaspirated (Bloch 1965: 83; Masica 1991: 177; Geiger 1994: §52.2). As given in (1e), the nasal-stop clusters may alternatively be split up by an epenthetic vowel (Pischel 1981: §131; von Hinüber 2001: §152; Oberlies 2019: 75, 88). Note also that, contrary to the generalization just stated, the assimilated outcome of *jñ* is consistently a nasal instead of a stop, as in (1f) (Pischel 1981: §276; Geiger 1994: §53.1; von Hinüber 2001: §251; Oberlies 2019: 149). Homorganic nasal-stop clusters, which are cross-linguistically common and are agreed to be unmarked, generally remain unchanged (Masica 1991: 178–179), as in (1g), and thus are not discussed in this paper.

- (1) a. *bhakti* > *bhatti* ‘devotion’  
       *labdha* > *laddha* ‘receive, PAST.PASS.PPL.’
- b. *alpā* > *appā* ‘small’  
       *kalpā* > *kappā* ‘proper’
- c. *paścāt* > *pacchā* ‘afterwards’  
       *tiṣṭant* > *tiṭṭhanta* ‘stand, PRES.PPL.’  
       *asti* > *atthi* ‘be, 3SG.PRES.IND.’
- d. *vṛkṣa* > *rukkhā, vakkhā* ‘tree’  
       *cikitsati* > *cikicchati* ‘reflect, 3SG.PRES.IND.DESID.’

e. *agni* > *aggi* ‘fire’

*ātman* > *atta* ‘self’ beside *atuma*

*āpnoti* > *appoti* ‘attain, 3SG.PRES.IND.ACT.’

cf. *prāpnoti* > *pāpūnoti* ‘attain, 3SG.PRES.IND.ACT.’

f. *jñāti* > *ñāti* ‘relative’

*rājñah* > *rañño*, *rājino* ‘king, DAT./GEN.SG.’

g. *maṅgala* > *maṅgala* ‘auspicious’

*pañca* > *pañca* ‘five’ cf. *pañcāsat* > *paññāsa* ‘fifty’

*daṇḍa* > *daṇḍa* ‘stick’

*anta* > *anta* ‘end’

*ārambha* > *ārambha* ‘attempt’

Clusters across a compound boundary present another exceptional pattern. Thus, the final stop in *ud-/ut-* assimilates to whatever is the initial consonant of the second element as in (2a) (von Hinüber 2001: §§237, 249; Geiger 1994: §57; Suzuki 2002a: 117–118; Oberlies 2003: 180, 183; 2019: 166–167). Note that the Pali form is derived from the morphologically analyzed form rather than from the Sanskrit form. On the other hand, the final sibilant of *duṣ-* and *niṣ-* may or may not leave aspiration on the assimilated outcomes as in (2b) (Pischel 1981: §302).

(2) a. \**ut-śrita* > *ussita* ‘erected’ cf. Skt. *ucchrīta*

b. *duṣkara* > *dukkara* ‘difficult’

*niṣkramati* > *nikkhamati* ‘go forth from, 3SG.PRES.IND.ACT.’

This paper examines the development of stop clusters in the six dialects of Aśokan Rock Edicts, i.e., Gīrnār (G.) in the west, Shāhbāzgarhī (Sh.) and Mānsehrā (M.) in the north-west, Kālsī (K.) in the north, and Dhaulī (Dh.) and Jaugāḍa (J.) in the east. In the conventional dichotomy of these dialects, the western group consists of Gīrnār, Shāhbāzgarhī, and Mānsehrā while the eastern group includes Kālsī, Dhaulī, and Jaugāḍa. The transliterated examples are cited from Hultzsch (1925: 183–213) and are accompanied by the chapter number and the alphabetic letter attached to the sentence by Hultzsch’s (1925) punctuation:

for example, 3B refers to the second sentence in chapter 3 of the Rock Edicts. Square brackets indicate uncertain readings. In the original scripts, geminates are generally not marked. Thus, for example, *agi* ‘fire’ (< *agni*), *athi* ‘be, 3SG.PRES.IND.ACT.’ (< *asti*), and *raño* ‘king, DAT./GEN.SG.’ (< *rājño*) are phonetically *aggi*, *atthi*, and *rañño*. Anusvāra followed by a nasal as in *rañño* must represent a geminate nasal as in *raññō*. In the inscriptions from Mānsehrā and Shāhbāzgarhī, vowel length is not marked (Bloch 1950: 50), e.g., M. *rajina* for *rājīnā* ‘king, INS.SG.’. Vowel sandhi is undone where the preceding form is irrelevant for discussions, e.g., G. *-abhisitena* ‘annoint, INS.SG.PRES.PPL.’ from *vāsābhisitena* ‘year-anoint’ 3B.

Each of the following four sections examines different types of stop clusters: stop-stop and *l*-stop clusters in section 2, sibilant-stop clusters in section 3, stop-sibilant clusters in section 4, and stop-nasal clusters in section 5. Section 6 provides conclusions. As will be shown, stop-final clusters develop nearly consistently into stops, unless unchanged, while stop-initial clusters show variations in the directions of assimilation and the development alternative to assimilation.

## 2. Stop + stop and *l* + stop

Stops and the liquid *l* share the property of having an oral contact and thus are grouped together in this section. Both types of consonant clusters occur only medially and are subject to anticipatory assimilation with no dialectal variation, as in (3a) (Ghatage 1962: 113–114; von Hinüber 2001: §226.2). The development exemplified in (3b) appears somewhat idiosyncratic in that the coda stop is nasalized in Kālsī and Shāhbāzgarhī although the outcome with the original second stop conforms to the productive pattern.

(3) a. Skt. *abhisiktēna* > 3B ‘annoint, INS.SG.PRES.PPL.’

G. *-abhisitena*, K. *-abhisitena*, Sh. *-abh[i]sī[tena]*, M. *-abhisetena*,

Dh. *-abhisitena*, J. *-abhisitena*

Skt. *yuktasya* > 5J ‘yoked, GEN.SG.’

G. *-yutasa*, K. *-yutas[ā]*, Sh. *-yutasa*, M. *-yutasa*, Dh. *-yutas[a]*

Skt. *gupti* > 12D ‘guarding, NOM.SG.’

G. *-guti*, K. *-guti*, Sh. *-guti*, M. *-guti*

Skt. *labdheṣu* > 13C ‘gained, LOC.PL.’

G. *ladhesu*, K. *ladheṣa*, Sh. *ladh[e]ṣu*, M. *la[dhe]ṣu*

b. *yat-cet* > 9N ‘if’ (cf. Woolner 1924: 148r)

K. *hamce*, Sh. *hamce*, M. *hace*

The original clusters of *l* and a stop are small in number and are restricted to *lp*; it becomes *p* by anticipatory assimilation as in (4).

(4) Skt. *kalpam* > 5E ‘cycle, ACC.SG.’

G. *-kaṃpā*, K. *-kaṃam*, Sh. *-kaṃam*, M. *-[ka]ṃam*, Dh. *-kaṃam*

Skt. *alpā-* > 9E ‘small, STEM’

G. *apa-*, K. *apa-*, Sh. *apa-*, M. *apa-*, Dh. *[a]pa-*, J. *apa-*

Table 1 summarizes the outcomes of stop-stop and *l*-stop clusters, which are uniformly the prevocalic stop of the original cluster. C<sub>1</sub> and C<sub>2</sub> stand for the first and second consonant, respectively, of the bi-consonantal cluster. This dominance of the second consonant of the bi-consonantal clusters is cross-linguistically observed, which results in the priority of anticipatory over perseverative assimilation (Ohala 1990; Hock 1991: 63; Côté 2000; Blevins 2004; Cho 1999; Kiparsky 2003; Jun 2011; Zsiga 2011: 1934; Bybee 2015: 475–477; Gordon 2016: 124, 128, 129; Recasens 2018: 9, 12, 31).

TABLE 1 : The development of stop-stop clusters and *lp* in the Rock Edicts

Input clusters	stop-stop/C <sub>1</sub> C <sub>2</sub>	<i>lp</i>	TOTAL
Girnār	C <sub>2</sub> 21	<i>p</i> 6	C <sub>2</sub> 27
Kālsī	C <sub>2</sub> 30	<i>p</i> 6	C <sub>2</sub> 36
Shāhbāzgarhī	C <sub>2</sub> 32	<i>p</i> 5	C <sub>2</sub> 37
Mānsehrā	C <sub>2</sub> 27	<i>p</i> 6	C <sub>2</sub> 33
Dhauī	C <sub>2</sub> 16	<i>p</i> 6	C <sub>2</sub> 22
Jaugaḍa	C <sub>2</sub> 2	<i>p</i> 2	C <sub>2</sub> 4
TOTAL	C <sub>2</sub> 128	<i>p</i> 31	C <sub>2</sub> 159

### 3. Sibilant + stop

In contrast to stop clusters and *lp*, sibilant-stop clusters show inter-dialectal variations with respect to preservation or assimilation of the original clusters. More specifically, examples in (5) show assimilation in all dialects in (5a), in all except Girnār in (5b), and in only the eastern dialects in (5c) (Bloch 1950: §14; 1965: 84; Mehendale 1948: 22; von Hinüber 2001: §229). Note that aspiration may or may not persist in the assimilated output, but tends to persist more often in Girnār and the eastern dialects than in Shāhbāzgarhī and Mānsehrā. In (5d) are given the outputs of the tri-consonantal cluster *str*. The development that shows the contrast between preservation in the west and assimilation in the east involves the original cluster *st*, as in (5c), although *str* is assimilated also in Girnār as in (5d). The contrast between preservation in Girnār and assimilation in the rest involves the original retroflex cluster and dental cluster from the root *sthā* ‘to stand’ as in (5b). When the stop is palatal, velar, or aspirated dental that is not from the root *sthā*, the original sibilant-stop clusters are assimilated in all dialects as in (5a). Note here that the word from Skt. *sthavira* is attested only in Girnār. Thus, different variations apparently depend on the phonetic properties of the input clusters.

(5) a. Skt. *paścāt* > 1H ‘afterwards’

G. *pachā*, Sh. *paca*, M. *paca*, Dh. *pachā*, J. *pachā*

Skt. *skandhāni* > 4B ‘mass, ACC.PL.’

G. *-kh[a]m̐dhāni*, K. *-kam̐dh[ā]ni*, Sh. *-kam̐dhani*, M. *-kam̐dhan[i]*,

Dh. *-kam̐dhāni*

Skt. *sthavira* > 4C ‘elder, STEM’ G. *thaira-*

b. Skt. *śreṣṭha* > 4G ‘best, NOM.SG.N.’

G. *seṣṭe*, K. *seṭhe*, Sh. [s]reṭham̐, M. *sreṭhe*, Dh. se[ṭhe]

Skt. *grhastha* > 12A ‘householder, NOM.PL.’

G. *gharastāni*, K. *gahathāni*, Sh. *grahathani*, M. *gehathani*

Skt. *adhīsthānam* > 5J ‘establishment, DAT.SG.’

G. *-adhīsthānāya*, K. *-adhīthā[nāye]*, Sh. *-adhīthanāye*, M. *-adhīthā[nā]ye*,  
Dh. *-adhīthān[ā]ye*, J. *-a[dh]i[th]ānā*

c. Skt. *nāsti* > 6H ‘not-be, 3SG.PRES.IND.ACT.’

G. *nāsti*, K. *nāthi*, Sh. *[nā]sti*, M. *nasti*, Dh. *nath[i]*, J. *nāthi*

Skt. *samstuta* > 3D ‘acquaintance, NOM.SG.N.’

G. *-samstuta-*, K. *-samthuta-*, Sh. *-samst[u]ta-*, M. *-sa[m]stuta-*,  
J. *-samthe[s]...*

Skt. *anusāsti* > 8E ‘instruction, NOM.SG.’

G. *-anus[a]sti*, K. *-anusathi*, Sh. *-anusāsti*, M. *-anusāsti*, Dh. *-anu[sath]i*

d. Skt. *strī-* > 12M ‘woman, STEM’

G. *ithī-*, K. *ithi-*, Sh. *i[stri-]*, M. *istri-*

Sibilant-stop clusters across a compound boundary show uniform development in all dialects though the output may lack or retain aspiration.

(6) Skt. *duṣkara* > 6N ‘difficult, STEM’

G. *dukaram*, K. *dukale*, Sh. *[du]kara*, M. *dukare*, Dh. *dukale*, J. *dukale*

Skt. *niṣkrami/niṣkramithāḥ* > 8C ‘go out, 3SG.AOR.’

K. *nikhamithā*, Sh. *nikrami*, M. *nikrami*, Dh. *[n]ikhami*

Table 2 gives the numbers of preserved sibilant stop clusters as ‘ST’ and assimilated clusters as ‘T/Th’ in the six dialects of the Rock Edicts. The hyphen as in ‘*ṣ-k/ṣ-kr*’ in the third row represents a compound boundary. While the three eastern dialects consistently show assimilation, the western dialects preserve some of the sibilant-stop clusters, i.e. *st* and, in part, *str* in Shāhbāzgarhī and Mānsehrā and *ṣṭ* and *sth* in addition to *st* in Gīrnār. The preserved clusters are all coronal.

TABLE 2 : The development of sibilant-stop clusters in the Rock Edicts

Input clusters	Girnār		Kālsi		Shāhbāzgarhī		Mānsehrā		Dhauri		Jaugāḍa	
	ST	T/Th	ST	T/Th	ST	T/Th	ST	T/Th	ST	T/Th	ST	T/Th
<i>śc</i>	0	2	0	1	0	2	0	2	0	1	0	1
<i>ṣ-k/ṣ-kr</i>	0	7	0	10	0	9	0	10	0	9	0	3
<i>ṣṭ</i>	4	0	0	3	0	3	0	3	0	3	0	1
<i>ṣ-p</i>	0	0	0	0	0	0	0	0	0	1	0	0
<i>sk</i>	0	1	0	1	0	1	0	1	0	1	0	0
<i>st</i>	24	0	0	28	26	0	20	1	0	11	0	10
<i>str</i>	2	1	0	2	3	1	1	1	0	2	0	0
<i>sth</i>	3	3	0	5	0	6	0	5	0	4	0	2
TOTAL	31	14	0	50	29	22	21	23	0	32	0	17
ratio of the sibilant-clusters	68.9%		0%		56.9%		47.7%		0%		0%	

#### 4. Stop + sibilant

The stop-sibilant clusters in Old Indo-Aryan are categorized into two groups based on their developments in the Rock Edicts, i.e., *kṣ* and the others. The cluster *kṣ* results from RUKI or sibilant retroflexion of the original *s* after *k* (Whitney 1889: §180; Wackernagel 1896: §203; Thumb 1958: §153; Renou 1975: §13), which is reasonably interpreted as assimilatory retraction (Allen 1973: 103–105; Cho 1999: 77–80; Cardona 2003: 119; Kobayashi 2004: 149; Suzuki 2016), and occurs frequently in both initial and medial positions within a morpheme. Generally, the original *kṣ* changes into *ch/cch* in the west but *kh/kkh* in the east (Bloch 1950: 56; 1965: 84; Geiger 1994: §56.1; Oberlies 2019: 159). In the Rock Edicts, the eastern dialects mostly show *kkh*, but the western dialects show either of the two in addition to the original *kṣ* in Shāhbāzgarhī and Mānsehrā, as in (7a) with the development of the initial and medial *kṣ* and (7b) with the development of *kṣy* with the future suffix *-sya-* (von Hinüber 2001: §232).

(7) a. Skt. *vr̥kṣa* > 2D ‘tree, NOM.PL.’

G. *vračhā*, K. [*lu*]khāni, M. *ruchani*, Dh. *lukhāni*, J. *lukhāni*

Skt. *kṣudrakena* > 10E ‘minute, INS.SG.’

G. *chudakena*, K. *khudakena*, Sh. *khudrakena*, M. *khudakena*

Skt. *kṣaṇati* > 12G ‘hurt, 3SG.PRES.IND.’

G. *chaṇati*, K. *chanati*, Sh. *kṣaṇati*, M. *chaṇati*

Skt. *adhyakṣa-* > 12M ‘overseer, STEM’

G. *-jhakha-*, K. *-dhiyakha-*, Sh. *-[dhi]yakṣa-*, M. *-jakṣa-*

b.Skt. *drakṣyati* > 1D ‘see, 3SG.PRES.IND. (< FUT.)’ (cf. Woolner 1924: 91r)

K. *dakhati*, Sh. *[da]khati*, M. *[da]kha[ti]*, J. *drakhati*

Other stop-sibilant clusters attested in the Rock Edicts involve a morpheme boundary between the two consonants. The first and second examples in (8a) involve the locative plural suffix *-su* and the desiderative suffix *-sa-*, respectively. The cluster changes into an aspirated stop only in Girnār as in *cikīcha* (von Hinüber 2001: §237). In the other dialects the stop drops. However, if the locative plural form of ‘six’ developed out of Middle Indo-Aryan *ṣa* without the final consonant, followed by the inflectional ending, rather than from Skt. *ṣaṭsu*, the sibilant is the expected outcome. Note that Girnār lacks this particular form. In compounds in (8b), the final stop in *ud-/ut-* drops as expected.

(8) a. Skt. *ṣaṭsu* > 13Q ‘six, LOC.’ K. *ṣaṣu*, Sh. *ṣaṣu*, M. *ṣaṣu*

Skt. *cikitsa-* > 2A ‘hospital, NOM.PL.’

G. *cikīcha*, K. *cikisakā*, Sh. *cik[i]sa*, M. *cikisa*

b. *ut-śrita* > 10F ‘great, INS.SG.’ cf. Skt *ucchrīta*

G. *usaṭena*, K. *[u]ṣaṭe[na]*, Sh. *usaṭe...*, M. *usaṭena-*, Dh. *u[saṭena]*,

J. *usaṭena*

*ut-sthānam* > 6J ‘exertion, NOM.SG.’ cf. Sk *utthānam*

G. *ustānaṃ*, K. *uṭh[āne]*, Sh. *uthanaṃ*, M. *uṭhane*, Dh. *[u]ṭhān[e]*, J. *uṭhāne*

Other than the examples discussed so far, possible outcomes of a cluster that involves a stop-sibilant sequence are given in (9). The western outputs suggest the input cluster  $r\zeta y$  (Hultsch 1925: lxviii, lxxxix), whereas the eastern outputs can be derived from  $rtsy$  (Woolner 1924: 77r). The relevant forms, such as those in (9), are excluded in the table below because the input may not involve a sequence of a stop and a sibilant.

- (9) \**kartsyati/karṣyati* > 5F 'do, 3SG.FUT.'  
 G. *kāsati*, K. *kachati*, Sh. *kaṣati*, M. *kaṣati*, Dh. *kachati*

Table 3 summarizes the outcomes of the stop-sibilant clusters in the six dialects of the Rock Edicts. T, *Th*, and S in the 'TOTAL' row and column represent stops (both aspirated and unaspirated), aspirated stops, and sibilants, respectively. While  $k\zeta$  develops into an aspirated stop if assimilated, the contrast between velar in the east and palatal in the west as an outcome of  $k\zeta$  is not straightforward in the Rock Edicts. On the other hand,  $ts$  or possibly  $\zeta s$  becomes a sibilant except in Girnār. This may result from the unreleased stop preceding a sibilant. However, the relevant examples are too few and in part too equivocal to permit any generalization.

TABLE 3 : The development of stop-sibilant clusters in the Rock Edicts

Input clusters	$k\zeta$	$ts/\zeta s$	TOTAL
Girnār	<i>kh</i> 2, <i>ch</i> 7	<i>ch</i> 3	<i>Th</i> 12
Kālsī	<i>kh</i> 8, <i>ch</i> 1	$\zeta/s$ 4	<i>Th</i> 9, S 4
Shāhbāzgarhī	$k\zeta$ 9, <i>kh</i> 2	$\zeta/s$ 4	TS 9, <i>Th</i> 2, S 4
Mānsehrā	$k\zeta$ 2, <i>kh</i> 3, <i>ch</i> 2	$\zeta/s$ 4	TS 2, <i>Th</i> 5, S 4
Dhaulī	<i>kh</i> 3	<i>s</i> 2	<i>Th</i> 3, S 2
Jaugaḍa	<i>kh</i> 3	<i>s</i> 2	<i>Th</i> 3, S 2
TOTAL	TS 11, <i>Th</i> 31	<i>Th</i> 3, S 16	TS 11, <i>Th</i> 34, S 16

## 5. Stop + nasal

In parallel with stop-sibilant clusters, stop-nasal clusters are categorized into two groups, i.e. homorganic  $j\tilde{n}$  and heterorganic clusters. In Old Indo-Aryan, the palatal nasal is derivative

and occurs only when preceding or following a palatal stop by place assimilation (Wackernagel 1896: §165; Ghatage 1962: 118; Masica 1991: 159; Kobayashi 2004: 20). The cluster occurs in two morphemes in the Rock Edicts, i.e. the derivatives of the root *jñā* ‘to know’ and the inflected forms of *rājan* ‘king’. The outcome of *jñ* is a nasal by anticipatory assimilation initially (i.e. from *jñā*) in all dialects and medially (i.e. from *rājan*) in Gīrnār and Shāhbāzgarhī, but results from vowel epenthesis in Mānsehrā and the three eastern dialects, as in (10) (Mehendale 1948 xxiv–xxv; Ghatage 1962: 118–119; von Hinüber 2001: §251).

(10) Skt. *jñāti* > 4C ‘relative, GEN./LOC.PL.’

G. *ñātīnām*, K. *nāti*[*nam*], Sh. *ñatina*[*m*], M. *ñatina*, Dh. *nātisu*, J. *nātisu*

Skt. *rājño* > 4F ‘king, GEN.SG.’

G. *rāño*, K. *lājine*, Sh. *raño*, M. *rajine*, Dh. *lājine*, J. *lājine*

On the other hand, heterorganic stop-nasal clusters show different developments, depending on the dialects and on the types of input clusters. As in (11), the only instance of *gn* is assimilated into a stop in all the attested dialects, whereas *pn* is split up by an epenthetic vowel (Ghatage 1962: 117, 118). The outcomes of the original *ātman* have a medial *t* by assimilation in Kālsi and Shāhbāzgarhī, either *t* by complete assimilation or *tv* by denasalization in Mānsehrā, and *tp* by assimilatory strengthening in Gīrnār.

(11) Skt. *agni* > 4B ‘fire, STEM’

G. *agi-*, K. *agi-*, M. *agi-*, Dh. [*a*]gi-

Skt. *ātman* > 12H ‘self, STEM’

G. *ātpa-*, K. *ata-*, Sh. *ata-*, M. *atva-* cf. 12D M. *ata-*

Skt. *prāpnoti* > 4E ‘attain, 3SG.PRES.IND.ACT.’

G. *prāpunati*, K. *pāpunāta*, Sh. *prapūnati*

Table 4 shows the development of the two types of stop-nasal clusters, i.e., *jñ* and others. T, N, and V represent stops (both aspirated and unaspirated), nasals, and vowels, respectively. The original *jñ* corresponds either to a nasal rather than a stop by assimilation,

contrary to the generalization of Middle Indo-Aryan assimilation, or to *jin* by vowel epenthesis with no place assimilation of the nasal. Other attested nasal-stop clusters, all of which are heterorganic, become a stop (and not a nasal) as expected, are split up by an epenthetic vowel, or, in the case of the original *tm*, are subject to denasalization. The homorganic *jñ* is subject to regular anticipatory assimilation with a nasal as an outcome while heterorganic clusters opt for other alternatives that tend towards a stop as an outcome or preserve the stop in the output instead, including perseverative assimilation, fortition of the onset consonant, and vowel epenthesis. Moreover, although homorganic nasal-stop clusters typically resist assimilation or vowel epenthesis, none of the stop-nasal clusters remain unchanged.

TABLE 4 : The development of stop-nasal clusters in the Rock Edicts

Input clusters	<i>jñ</i>	<i>gn, tm, pn</i>	TOTAL
Girnār	N 26	TT 8, T 1, TVN 1	T 1, N 26, TVN 1, other 8
Kālsi	N 11, <i>jin</i> 11	T 9, TVN 1	T 9, N 11, TVN 12
Shāhbāzgarhī	N 23	T 9, TVN 1	T 9, N 23, TVN 1
Mānsehrā	N 9, <i>jin</i> 12	<i>tv</i> 6, T 3	T 3, N 9, TVN 12, other 6
Dhaulī	N 6, <i>jin</i> 7	T 1	T 1, N 6, TVN 7
Jaugada	N 3, <i>jin</i> 8		N 3, TVN 8
TOTAL	N 78, <i>jin</i> 38	T 23, TVN 3, other 14	T23, N78, TVN41, other14

## 6. Conclusion

Stop-final clusters and stop-initial clusters show contrasting developments. The original clusters that belong to the first group—i.e., stop-stop clusters, *lp*, and sibilant-stop clusters—uniformly become stops by anticipatory assimilation, except for some residues of the original sibilant-stop clusters in the western dialects. There are no other developments with vowel epenthesis or partial assimilation. On the other hand, of the original stop-sibilant/nasal clusters, those clusters that have undergone place assimilation in Old Indo-Aryan show relatively straightforward developments in the Rock Edicts: *kṣ* becomes a stop with some residues of the original clusters in Shāhbāzgarhī and Mānsehrā, and *jñ* becomes a nasal, although medially it is affected by vowel epenthesis in the eastern dialects and in part in

Mānsehrā. Stop-sibilant clusters other than  $kṣ$  typically become sibilants rather than stops; stop-nasal clusters other than  $jñ$  are affected by complete perseverative assimilation ( $gn > g$ ,  $tm > t$ ), possibly assimilatory denasalization ( $tm > tp, tv$ ), or vowel epenthesis ( $pn > pun$ ).

Although, as illustrated in section 1, Middle Indo-Aryan assimilation is often accounted for in terms of a uniform principle of consonant hierarchy, at least two independent and partly contradictory tendencies emerge in the development of the stop clusters in the Rock Edicts: first, dominance of the second consonant of the cluster observed in the development of the stop-final clusters,  $jñ$ , and possibly stop-sibilant clusters other than  $kṣ$ ; second, dominance of the stop articulation observed in  $kṣ$  and some of the stop-nasal clusters. In terms of dialectal variations, partial preservation in the west as opposed to complete loss of the original clusters in the east is salient in the development of sibilant-stop clusters. In addition, assimilation in the west as opposed to epenthesis in the east is observed in the development of medial  $jñ$ .

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