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Palatalization in Central Bùlì

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Abstract

Palatalization is a process through which non-palatal consonants acquire palatality, either through a shift in place of articulation from a non-palatal region to the hard palate or through the superimposition of palatal qualities on a non-palatal consonant. In both cases, there is a front, non-low vowel or a palatal glide that triggers the process. In this paper, I examine the palatalization phenomena in Bùlì using Feature Geometry within the non-linear generative phonological framework. I argue that both full and secondary palatalization occur in Buli. The paper further explains that, the long high front vowel /i:/, triggers the formation of a palato-alveolar affricate which is realized in the Central dialect of Bùlì, where the Northern and Central dialects retain the derived palatal stop.

Keywords: Palatalization, Bùlì, Feature Geometry, synchronic, diachronic

Introduction

Although linguists generally agree that palatalization is a process through which non-palatal consonants acquire palatality, they differ in their accounts of the phonological processes that characterize it. As Halle (2005, p.1) states, "… palatalization raises numerous theoretical questions about which there is at present no agreement among phonologists". Cross linguistic surveys conducted on the process reveal a number of issues that lead to the present state of affairs. (Chen, 1973; Bhat, 1978; Kochetov, 2002; Stadnik, 2002; Bateman, 2007). One

issue is that the phonetic processes of acquiring palatality are manifested in several different ways within and across languages. Another issue is that, some palatalization processes are triggered by some morphological environments. (Russian: Lightener, 1965; Tswana: Cole, 1963; Somali: Bendjabellah, 1998; and SiSwati: Bateman, 2007). Yet another issue is that, some palatalization processes are diachronic/historical processes (Hyman, 1975).

These complexities notwithstanding, two broad categories of palatalization processes are established, primary palatalization where the place of articulation of a non-palatal consonant is changed to palatal place due to the influence of, usually, a front non-low vowel or the palatal glide [j]; and secondary palatalization, which involves the superimposition of the high feature of a front non-low or palatal glide on the consonant.

In this paper, I examine some aspects of palatalization in Bùlì. I show that it manifests the alveo-palatal affricates [tɕ, dʑ] which are derived from the velar stops /k, g/ respectively. I explain that these affricates are an innovation since other related Gur languages as well as the other two dialects of Bùlì, namely the Northern and Southern dialects, have stops where the Central dialect has the affricates.

The analysis of the data is done within Feature Geometry, a framework that construes segments as molecules with atomic structure. Under this theory, features are organized hierarchically into functionally related classes which are grouped into nodes. The highest node is the root node. This node corresponds to the segment, and is defined by the major class features, namely the Consonantal (Cons), Syllabic (Syl) and Sonorant (Son) features. This root node immediately dominates the functional nodes, which are the Laryngeal and Supra-laryngeal nodes. The latter also projects the Place of Articulation (PA) and Manner of Articulation (MA) nodes. The terminal nodes projecting from these functional nodes are the features which specify in detail, the nature of segments. The diagram in (2) gives a Feature

Geometrical representation of the segment [s], which has a feature matrix as follows in (1):

Fig. 1. Feature matrix of [s]

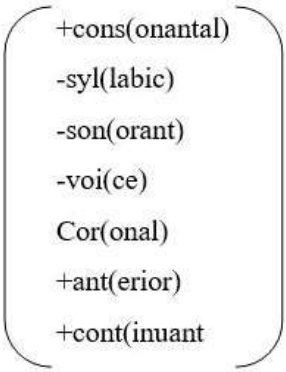
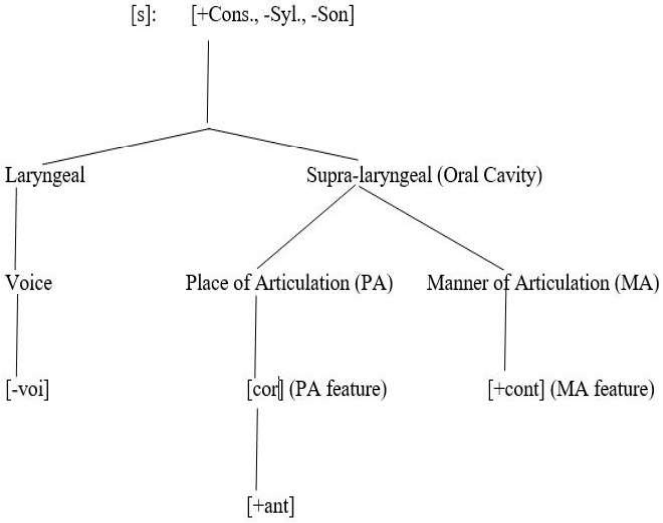


Fig. 2. Feature Geometry of [s]



The Feature Geometrical representation indicates that the production of speech sounds is a coordinated activity. The terminal nodes represent articulations while the higher nodes

are functional and categorize the terminal nodes. Phonological processes may either target functional nodes and therefore affect all features projecting from such nodes, or the individual terminal nodes alone. This framework shall be used in the analysis of the palatalization process in Bùlì.

The Bùlì Language

The Bùlì language area is located in the Upper East region of Ghana, and covers an area of approximately 2,200km². It is bordered in the north by the Kasem language area, to the east by Gurene, to the south by the Kɔnni and Mampruli language areas, and to the west by the Sisaala language area. Administratively, the Bùlì language area is located in the two Bulsa Districts, namely, the Bulsa North and the Bulsa South Districts with their capitals in Sandema and Fumbisi respectively. Major towns in the Bulsa North District include Wiaga, Kaadema, and Chuchuliga, while those in the Bulsa South District include Kanjarga, Siniensi, Gbedema and Dogninga.

Though largely homogenous, Bùlì can be said to have three main dialects, namely, the Northern, Southern, and Central dialects. The Northern dialect is spoken mostly in Chuchuliga and surrounding towns such as Chaana and Biuk. The Southern dialect, on the other hand is spoken in the entire Bulsa South District. The Central dialect is spoken in Wiaga, Sandema and Kaadema, which are in the Bulsa North District. In most cases, the Northern and Southern dialects share more commonalities with each other than with the Central dialect. The main systematic features that differentiate these dialects are phonological-both segmental and tonal.

At the segmental level, one of the main features that separates the Northern and Southern Bùlì from the Central dialect is vowel quality. For instance, where the Central dialect has diphthongs, the two other dialects have long monophthongs, as illustrated in Table (1).

Table 1

Northern	Southern	Central	Gloss
a. bā:gā	bā:k	biāk	'dog'
b. wà:ŋ	ŋmāŋ	wàuŋ	'monkey'
c. dō:gī	dō:g	dʊɛ̄g	'lie down'
d. kpé:ŋà	kpé:ŋ	kpiéŋ	'big'

At the consonantal level, we note among other things, the pervasive correspondences between the alveo-palatal affricate [ʧ, ʤ] in the Central dialect and palatal stops [c, ɟ] in the other two dialects preceding front non-low vowels. These correspondences are shown in Table (2).

Table 2

Northern	Southern	Central	Gloss
a. ɟīnlá	ɟīnlá	dʒīnlá	'today'
b. ɟén	ɟén	dʒéín	'egg'
c. cī:rī	cī:rī	tɕī:rī	'vomit'
d. cēŋī	cēŋī	tɕēŋī	'go'
e. cī:nī	cī:nī	tɕī:nī	'count'
f. cī:k	cī:k	tɕī:k	'moon'
g. cɛ̄	cɛ̄	tɕɛ̄	'reap/harvest'

The correspondences in Table (2) notwithstanding, there are underlying forms in all three dialects that manifest the alveo-palatal affricates. But these are differentiated from the ones shown in Table (2) by virtue of the fact that their distribution is not limited to only front non-low vowel as illustrated in Table (3).

Table 3

a. dʑúm	'fish'
b. dʑā:b	'thing'
c. dʑām	'come'
d. dʑō	'enter'
e. tɕūb	'punch'
f. tɕōgsī	'catch'
g. tɕ ālī	'run'

The alveo-palatal affricate in the Central dialect is the product of diachronic palatalization. Two related pieces of evidence – one internal, the other external – are adduced to support this position. First of all, it is observed that older speakers of the Central dialect have both the palatal stops /c/ and /ɟ/ and the alveo-palatal affricates /tɕ/ and /dʑ/, where younger speakers consistently realize the latter. In other words, the alveo-palatal affricate in the speech of the younger speakers is the result of a split of the stop into a stop and the affricate.

To substantiate this finding, a survey involving 30 respondents from the three dialect areas was conducted to elicit the approval or disapproval of the pronunciation of four sentences, with /tɕ/ and /dʑ/ as the targets. The respondents were in two categories: those above 70 years representing the older speakers, and those between 15 and 30 years representing the younger speakers. Ten (10) speakers each were sampled from the three dialect areas, made up of five (5) males and five (5) females. Below in example 1 are the sentences.

Example 1.

a. dʑīnlá ká yābā dāí
Today be market day
'Today is a market day'

b. kpīāká lòbì dʑèí
hen Def lay Pst egg Indef
'The hen has laid an egg'.

c. tɕī:nī līgrāŋá
count Imp money Def
'Count the money!'

d. kpā:rɔ̄wá tɕè zā:ŋá
farmer Def cut Pst millet Pl
'The farmer harvested the millet'

All 20 respondents from the Northern and Southern dialects, for both younger and older speakers preferred the palatal stops /c/ and /ɟ/ instead of the affricates /tɕ/ and /dʑ/ used in /**dʑ**īnlá/ 'today', /**dʑ**èí/ 'egg', /**tɕ**ī:nī/ 'count', and /**tɕ**è/ 'harvest'.

For the Central dialect however, all 5 younger speakers agreed with the use of the affricates, while the older speakers had preference for the palatal stops as is the case of the Northern and Southern dialects. This is an indication that the affricates are an innovation, that are gradually replacing the stops. Table (4) shows the correspondence between the older speakers and the younger ones in the use of these sounds in the Central dialect.

Table 4

Older Speakers	Younger speakers	Gloss
cí:k ~tɕí:k	tɕí:k	'moon'
cì:b ~tɕì:b	tɕì:b	'chick'

Further evidence to buttress this first point derives from the wordlist of Rattray (1932). In this list, words which are pronounced today with the alveo-palatal affricate in the Central dialect are shown to have been pronounced with the palatal stop

as shown in Table (5).

The second external piece of support for positing the alveo-palatal affricate as an innovation is based on a comparison between Bùlì and closely related Gur languages. Bùlì is classified as an Oti-Volta language, along with Moore, Dagaare, Gurene, Kusaal, Talni, Nabt, Dagbani and Mampruli. In cognate words, these languages realize stops where Central Bùlì realizes the alveo-palatal affricate. The examples in Table (5) are cognates from 5 languages taken from Rattray (1932) that illustrate this point.

Table 5

Buli	Moore	Kusaal	Dagaare	Talni	Cen. Bùlì	Gloss
ceŋ	ceŋe	cem	ceŋ	ceŋ	tɕeŋi	'go'
cɛ	cɛa	cɛa	cɛ	cɛ	tɕɛ	'reap'
cik	ciugu	----	cu	---	tɕi:k	'moon'

The examples above show that the palatal stop is an older form, which the Southern and Northern dialects of Bùlì have retained, while the affricate is an innovation only present in the Central dialect.

Overview of the Consonant and vowel inventory of Bùlì

At the phonological level, Central Bùlì has 23 contrastive consonants and 9 basic vowels. These are shown in (6) and (7) respectively.

Consonants

In Table (6), the different places of articulation of the consonants are arranged from left to right and the manners of articulation from top to bottom. In those instances where there is a pair of phonemes differentiated only by the voice feature, the voiceless one appears on the left and the voiced counterpart on the right.

Table 6

	Labial	Lab-dent	Alveolar	alveo-pal	pal.	lab-velar	velar	glottal
Stop	p b		t d			kp gb	k g	
Fricative		f v	s z					(h)
Affricate				tɕ dʑ				
Lateral			l					
Trill/flap			r					
Nasal	m		n		ɲ	ŋm	ŋ	
Approximant					j	w		

The consonant inventory of Bùlì given in Table (6) above shows that it has 23 consonants; the voiceless glottal fricative /h/, has a very restricted distribution, and is found only in a small number of ideophones where it alternates with the voiceless alveolar fricative /s/. The inventory also shows that the language has two (2) underlying palatal sounds, namely the palatal nasal: /ɲ/, and the palatal glide: /j/, and two (2) alveo-palatal affricates: /tɕ dʑ/. The inventory also shows Buɜlì has (3) three velar consonants: /k, g, N/. The two velar obstruents are realized phonetically as alveo-palatal affricates [tɕ dʑ] before a high front long vowel. The relationship between the derived and underlying alveo-palatal affricates is discussed in subsequent sections.

Vowels

Bùlì has nine basic vowels as given in Table (7) below. Apart from these nine, there are four long vowels that occur in environments analogous to their basic counterparts, namely /i:,

a:, u:, o:/. In feature terms, they are construed as the basic short vowels plus the feature [+long] and represented thus [v:]. Bùlì therefore has 13 phonemic vowels.

Table 7

Front	Central	Back
i ɪ		u ʊ
e ɛ		o ɔ
	a	

Bùlì vowels also exhibit features that relate to tongue root position. The first of each of the pairs of vowels in Table (7), that is, /i, e, o, u/ are produced with an advanced tongue root posture designated as [+ATR], while the second of each pair, /i,ɛ,ɔ,ʊ/ as well as /a/ are produced with a retracted tongue root posture designated as [-ATR].

At the phonological level, Bùlì vowels manifest a harmony system based on their tongue root position, such that within phonological domains, only vowels with the same tongue root feature value can co-occur.

Vowel sequences occur in the underlying forms of Bùlì words, but these vowels do not surface at the phonetic level all the time. In a sequence with the high front vowel /i/ in the first position, it surfaces as the palatal glide [j], while the following vowel is lengthened. The examples in Table (8) show this.

Table 8

/ie/	/pieri/	[pʲēːrī]	'to blow' (wind instrument)
/io/	/miok/	[mʲoːkʷ]	'corner'
/iu/	/piuk/	[pʲuːkʷ]	'hyena'
/ɪɛ/	/mɪɛrɪ/	[mʲɛ̄ːrī]	'termite'
/ɪa/	/diak/	[dʲaːk]	'cost'

In a sequence that has the high back rounded vowel in the first position, it surfaces as a labial-palatal glide, [ɥ] when it is followed by a front non-low vowel, which triggers a similar lengthening of the succeeding vowel, as shown in Table (9). However, when it is followed by another back vowel, it surfaces as the labial-velar glide [w] with a similar lengthening of the succeeding back vowel as shown in Table (10).

Table 9

/ ui/	/tuita/	[tᵘíːtà]	'bean leaf'
/ue/	/tuem/	[tᵘēːm]	'sickness'
/ʊɛ/	/tʊɛk/	[tᵘɛ̄ːk]	'sour'

Table 10

/uo/	/puori/	[pʷōːrī]	'separate'
	/kuori/	[kʷōːrī]	'scoop'
/ʊɔ/	/pʊɔk/	[pʷɔ̄ːk]	'rot'
	/kʊɔk/	[kʷɔ̄ːk]	'cut'

Kröger (1992, p.2ff.) presents an inventory of phonetic vowels that show Bùlì to have diphthongs that have the high vowels followed by long vowels. He also claims that Bùlì allows a front high rounded vowel-[y], to precede both short and long vowels. As the data in (Tables 11, 12, and 13) show, Bùlì has sequences of phonemic vowels where the high vowels [i, ɪ, u, ʊ]

are followed by the vowels [e, o, u, ɛ, ɔ, a]. At the phonetic level however, the initial high vowels are realized as the glides [ʲ, ɥ, ʷ], which modify the quality of the onset consonants in the process, triggering lengthening of the second vowels in the sequence.

Table 11

/ie/	[ʲe:]
/io/	[ʲo:]
/iu/	[ʲu:]
/ɪɛ/	[ʲɛ:]
/ɪa/	[ʲa:]

Table 12

/ ui/	[ɥi:]
/ue/	[ɥe:]
/ʊɛ/	[ɥɛ:]

Table 13

/uo/	[ʷo:]
/ʊɔ/	[ʷɔ:]

Given the explanation above, an optimal Bùlì phonetic vowel inventory should not have [i, ɪ] and [u, ʊ] followed by long vowels. That is, [ie:, io:, iu:, ɪɛ:, ɪɔ:, ɪʊ:] and [ui:, ue:, uo:, ʊɪ:, ʊɛ:, ʊɔ:] are barred from the output of Bùlì forms. It should also not have [y] followed by a long vowel.

This is in sharp contrast with what Kröger (1992, p.2ff.) shows. All these instances of high vowels occurring as first members of Kröger's diphthongs actually manifest phonetically as part of the consonants in the onset of the syllable, what is described here as secondary palatalization.

Accounting for palatalization in Bùlì

Bùlì manifests two broad types of palatalization: the secondary palatalization process, which targets alveolars

[coronal, +anterior] and labial consonants; and the primary palatalization process, which targets velars [dorsal] consonants.

Secondary Pïalatalization

Secondary palatalization manifests as a secondary articulation process where the high feature of a front vowel is superimposed on an adjacent onset consonant. This results in a non-high consonant superimposed with the feature [high]. A secondary palatalized consonant is marked with the diacritic [ʲ], hence /ti/ is realized as [tʲ], a palatalized voiceless alveolar plosive. The superimposition of the high front feature on the onset may be accompanied by lip rounding when the high front vowel is preceded by the high back rounded vowel. For example, /tui/ is realized phonetically as [tᶣ]. This latter process is referred to as labio-palatalization. The data in Table (14) exemplifies the secondary palatalization process without lip rounding, while the data in Table (15) exemplifies the labio-palatalization process.

Table 14

/piērī/	[pʲē:rī]	‘to blow’ (wind instrument)
/miōk/	[mʲō:k]	‘corner’
/piūk/	[pʲ:ūk]	‘hyena’
/mɪɛ̄rī/	[mʲɛ̄:rī]	‘termite’
/diàk/	[dʲa::k]	‘cost’

Table 15

/tuítà/	[tᶣí:tà]	‘bean leaf’
/tuēm/	[tᶣē:m]	‘sickness’
/tʊɛ̄k/	[tᶣɛ̄:k]	‘sour’
/tuí:lím/	[tᶣí:lím]	‘heat’

As the data in Table (15) show, labio-palatalization targets only coronal consonants. The lip rounding feature is derived from the high back rounded vowels [u, ʊ] while the palatal feature is derived from the front non-low vowel that

follows in the second position. The underlying sequence of a coronal followed by a back mid vowel and a front non-low vowel is not attested in Bùlì as Table (16) shows:

Table 16

*[tɔɪ]
*[tɔɛ]

Secondary palatalization without lip rounding however affects both coronal and labial consonants, usually when they are followed by the front high unrounded vowels /i:/, /i/, and /ɪ/.

Table 17

Labial consonants

/pɪésí/	[pʲé:sí]	'peel'
/pɪúk/	[pʲú:kʷ]	'hyena'
/mɪók/	[mʲó:kʷ]	'corner'
/mɪɛ̄rī/	[mʲɛ̄:rī]	'termite'

Table 18

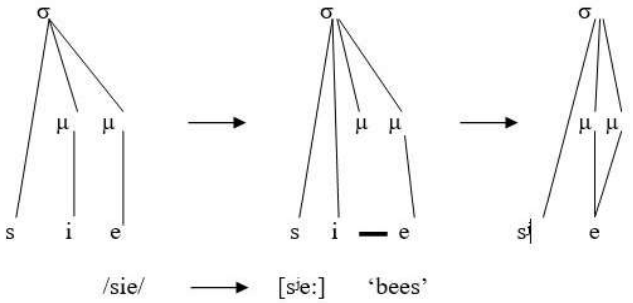
Coronal consonants

/tɪùk/	[tʲù:kʷ]	'thicket'
/tɪɛ̄rī/	[tʲɛ̄:rī]	'remember'
/sɪák/	[sʲá:k]	'wall'
/sɪé/	[sʲé:]	'bees'

The process is characterized by tongue-raising triggered by the front high vowels /i:/, /i/ and /ɪ/. Bhat (1978) calls this process 'tongue-raising', while Bateman (2007), Hall (2000), and Kochetov (2011) all call it 'secondary palatalization'. In the case of vowel sequences, when the front high vowels surface as the palatal glide, becoming part of the onset consonant, its slot is filled by extending the length of the second vowel. This extension is significant since it ensures that the moraic slot vacated by the first vowel of the sequence is filled. The naturalness of this

extension can be understood as a need to preserve the rhythmic structure of the syllable. (Hayes, 1989). Palatalization as a process in this case has not reduced the weight of the syllable. Figure 3 is a representation of the two processes that occur in this instance, viz, palatalization and compensatory lengthening.

Figure 3



Primary Palatalization

There are two types of primary palatalization processes in Bùlì: one is synchronic and involves only a shift from the velar place of articulation to the hard palate. This is also referred to as a 'tongue-fronting' process. (Bhat, 1978); 'full palatalization', (Bateman, 2007); 'coronalization; (Hume, 1992). The other is diachronic and involves a shift from velar place to the palato-alveolar region with an accompanying change in manner of articulation of stop to affricate, referred to as 'tongue-fronting with simultaneous spirantization' by Bhat (1978). This diachronic process is one of the features that distinguishes the Central dialect of Bùlì from the Northern and Southern dialects.

Synchronic Palatalization

The consonant inventory of Bùlì manifests three velar plosives: /k, g, ŋ/ and four palatals: /tɕ, dʑ, ɲ, j/. Of the four palatal consonants, only the nasal is a pure palatal and a plosive; the two obstruents are palato-alveolar affricates. Bùlì does not

have pure palatal obstruents. All three velars and all four palatals occur at the onset position of underlying syllables of Bùlì words as shown in Tables (19) and (20).

Table 19

Velars:	
/k/	
/kālī/	'sit'
/kērī/	'cut open'
/ kèrɔ́/	'make way'
/kírí/	'bottom of'
/kūlī/	'go home'
/kōlūk^{w}/	'testicles'
/kɔ́m/	'hunger'
/g/	
/gálà/	'left'
/gēlā/	'short'
/gīlīm/	' to circle'
/gūlī/	'regurgitate'
/gōrī/	'drum, type of'
/ŋ/	
/ŋīrī/	'neck'
/ŋārī/	'fetch'
/ŋō:sī/	'breast feed'
/ŋūsī/	'groan'

Table 20

Palatals

/tɕ/	
/tɕīm/	‘grow’
/tɕēŋī/	‘go’
/tɕūbī/	‘pierce’
/tɕōbī/	‘to stuff’
/tɕɔ̄gīsī/	‘catch’
/tɕālī/	‘ran’

/dʑ/	
/dʑī/	‘carry’
/dʑēntà/	‘soup’
/dʑū/	‘burn’
/dʑɔ̄/	‘enter’
/dʑɛ̄/	‘wrestle’
/dʑā:b/	‘something’

/ɲ/	
/ɲīŋ/	‘body’
/ɲɛ̄/	‘do’
/ɲā/	‘see’
/ɲūm/	‘smell’

The underlying forms given in Tables (19) and (20) are attested in all three dialects of Bùlì. At the surface level however, the velar obstruents that occur before the front non-low vowels: /i, ɪ, e, ɛ/ are realized as palatal plosives. As far as this process is concerned, it is general to all the three dialects of Bùlì. Therefore, the velar obstruents in Table (19) are realized as in Table (21) when they are followed by these front non-low vowels.

Table 21

/kērī/	[cērī]	'cut open'
/kɛ̀rɔ́/	[cɛ̀rɔ́]	'make way'
/kírí/	[círí]	'bottom of'
/gēlā/	[ɟēlā]	'short'
/gīlīm/	[ɟīlīm]	'to circle'

This process can be understood as fronting, where the velar consonants have assimilated to the frontness features of the following front vowels and are realized as palatals.

Diachronic Palatalization

According to the data in Table (21), velar obstruents surface as palatal plosives before short front non-low vowels, but that is not the only environment underlying velar obstruents occur in. Velar plosives also occur underlyingly before the only long high front vowel /i:/; however, their surface forms are not the same in all three dialects of Bùlì. Whereas the Northern and Southern dialects realize palatal plosives, the Central dialect realizes the alveo-palatal affricates- [tɕ, dʑ]. The data in Table (22) shows this correspondence between the realization of the velar plosives as palatal plosives in the Northern and Southern dialects, and the palato-alveolar affricate in the Central dialect.

Table 22

Underlying Form	North/South	Central	
/gí:rím/	[ɟí:rím]	[dʑí:rím]	'kindness'
/gí:rúk/	[ɟí:rúk]	[dʑí:rúk]	'eagle'
/kī:m/	[cī:m]	[tɕī:m]	'fry'
/kī:nī/	[cī:nī]	[tɕī:nī]	'count'

The data in Tables (21) and (22) show that in the Northern and Southern dialects, the front non-low vowels, both long and short, exert the same effect on preceding velar plosives – they are converted into palatal plosives. In the Central dialect on the

other hand, the long and the short vowels differ in this regard. The short front non-low vowels cause the velar plosives to be fronted just as in the other two dialects. Long front non-low vowels, however, cause fronting accompanied by a change in manner of articulation from plosive to affricate.

Discussion

As a phonological process, palatalization can be construed as a consonant-vowel co-articulation process, which is triggered when non-palatal consonants occur adjacent to front non-low vowels. In the absence of the front non-low vowel, the palatal approximant /j/, can also serve as a trigger. In feature terms, the front non-low vowels are [coronal, -anterior] since they are articulated with the front of the tongue. (Clements & Hume, 1995). The front non-low vowel also actively manifests the [+high] feature since it has the propensity to raise the height of adjacent consonants. Within the articulatory space, they lie between the velar consonants which are characterized as [dorsal], and the anterior sounds which are separated into the feature classes [coronal, +anterior] for the alveolar and dental sounds, which include /t,d,s,z,n…/; and [labial] for the sounds produced with the lips as active articulors, for example, /p,b,m,f,v/.

As the Bùlì data show, the effects exerted by the front non-low vowel as triggers of the palatalization process are manifold, and are a function of the feature specification of the consonants that occur adjacent to them. When the target consonants of the front non-low vowels are the anterior consonants, a raising process takes place, while the dorsals as targets, undergo a fronting process.

For example, the alveolar plosive /t/ is produced with a relatively low-lying blade of the tongue in the oral cavity. But the blade is caused to rise in anticipation of the front non-low vowel, thereby giving the alveolar plosive a raised colour as follows:

/t+i/ → [tʲ].

This is represented in feature terms as Phonological Rule (PR) 1 follows :

PR 1 : [cor, +ant] → [+high]/ − [+high].

The palatalization process involving dorsals is a place changing one. The process converts the velars into the palatals. As Hyman (1975) notes, since the velar place and front non-low vowel place are adjacent, the two cannot be naturally co-produced without co-articulatory adjustments. Therefore, a natural consequence of this process yields a palatal as output. The resultant palatal-front non-low vowel sequence is also easier to articulate.

The place change from dorsal to palatal is a process that is common to all three dialects of Bùlì. All three dialects manifest the process of converting the dorsals into palatals:

/k,g/ → [c, ɟ].

This is formalized in feature terms as PR 2:

PR 2. [dorsal] → [coronal, -anterior]/ − [cor, -ant]

However, the data in Central Bùlì shows a second process that further converts the palatal plosives into affricates:

[c, ɟ] → [t͡ɕ, d͡ʑ]

This second primary palatalization process requires not just only the front non-low vowel as trigger, but the non-low vowel should also be a long one. Bhat (1978) also refers to these vowels as either ‘strong or tense’. PR 3 captures this process.

PR 3. [cor, -ant, -cont] → [+del. Rel]/ − [+syl, +tense]

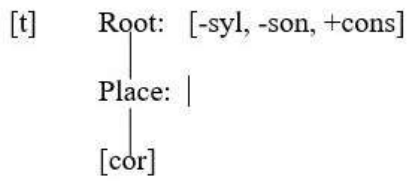
From the foregoing discussion, we note that the triggers of palatalization in Bùlì are the front non-low vowels /I/, /i/ and /i:/. These triggers are common to both primary and secondary

palatalization processes. However, only /i:/ triggers the realization of the affricates, that is, 'palatalization accompanied with spirantization'.

It is also noted that the targets of the triggers are [labial], [coronal, +anterior], and [dorsal] consonants. While the output of the process involving [labial] and [coronal, +anterior] consonants have secondary palatalization, the output of the process involving [dorsal] consonants have full palatalization.

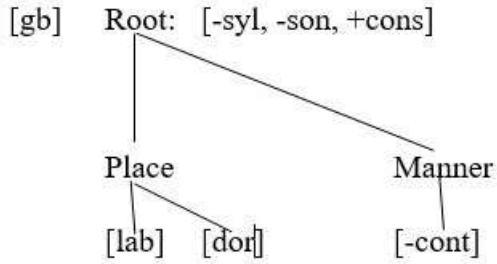
We explain these processes with the model of Feature Geometry used in Clement and Hume (1995), Clements (1989), and Hume (1992). Their models assume that sounds have unique structures which are defined by their features. By their feature composition, sounds are either simple, complex or contour by nature. Simple segments have one Root Node and one Oral Articulator feature. The sound [t] is a simple sound with this structure as in Figure (4):

Fig. 4



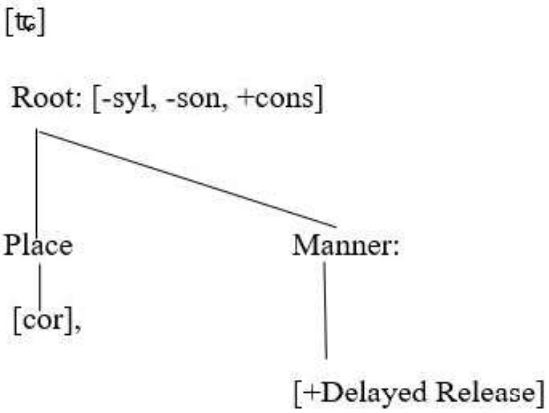
Complex sounds have one Root Node and at least, two Oral Articular features that are articulated simultaneously. Both have the same manner features (stricture): they are both [-cont(inuant)]. This is represented in Figure (5).

Fig. 5



Contour sounds on the other hand have one root, two place nodes, but these have two different manner features unlike the contours. In the case of the [t͡ɕ], the two places share a common coronal node but differentiated by one being [+ant] and the other [-ant], therefore, it will be represented with the common node [cor]. The manner features designating the two places are [-cont] and [+cont]. This in feature terms, is referred to as [+Delayed Release]. The representation of this complex sound is as shown in Figure (6). They represent a sequence of two different articulations but that are articulated simultaneously.

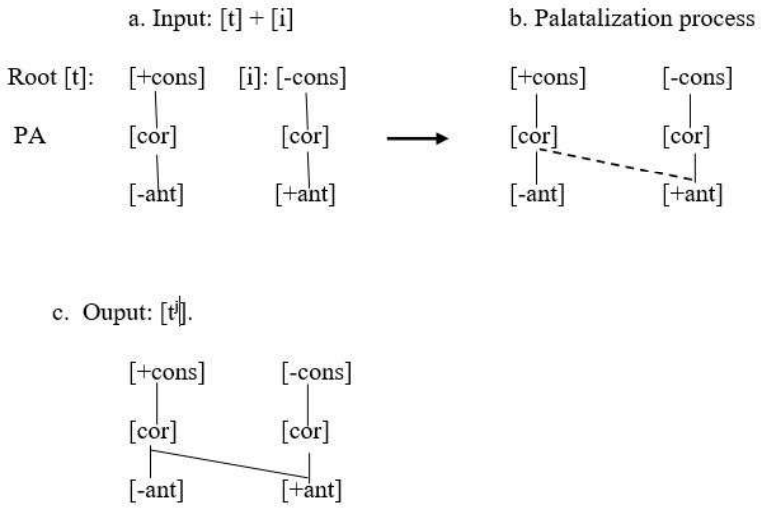
Fig. 6.



Palatalization as a process involves the spreading of features of triggers to targets. In this regard, place features of triggers target place features of targets, while manner of articulation features of triggers target manner features of the target consonants.

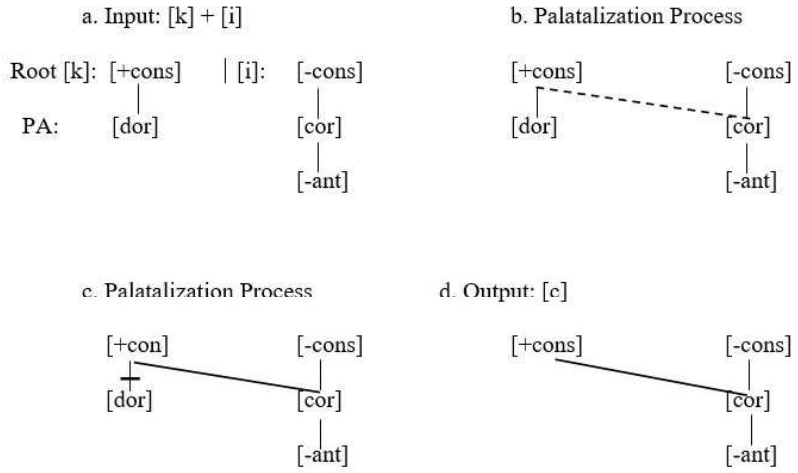
The feature geometrical representation of the palatalization process formalized in PR 1, is similar to what Clements and Hume (1989a) report about Acadian French. It involves the spread of the coronal features of the vowel to the consonant place node. The representation shows that the consonant place feature is not displaced. The consonant retains its primary place feature in addition to that of the vowel. This is represented in Figure (7).

Figure 7



The case of palatalization involving dorsals is a straightforward process of spreading the coronal features of the vowel to the dorsal place of articulation. The dorsal is then displaced through delinking to make way for the coronal feature. This is represented in Figure (8).

Figure 8



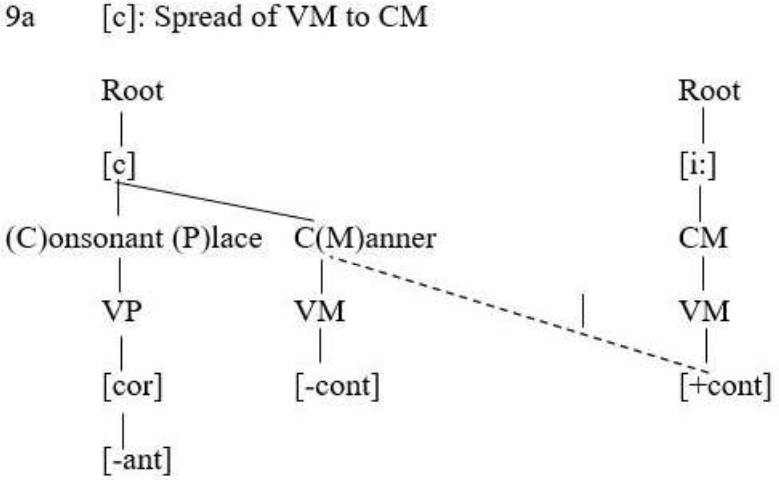
The output of the palatalization processes discussed in Figures (7) and (8) involve only places of articulation. The third one, [tɕ] that differentiates the Central dialect from the Northern and Southern dialects involves a manner change conditioned by the long/tense high front vowel /i:/. After undergoing palatalization, it is converted into a continuant to become a palatal fricative. This palatal fricative is then converted by default into the palateo-alveolar affricate since the language does not have a palatal fricative.

To represent this geometrically, I adopt the Constriction based model of Feature Geometry as used in Clements (1989, 1991) and Hume (1992). This model allows us to designate both consonants and vowels with the same place features: [labial], [coronal] and [dorsal]. This categorizes consonants and vowels as a Natural Class since they share the same place features. This prediction is phonetically grounded as both consonants and vowels are produced with the same organs of speech in the oral cavity.

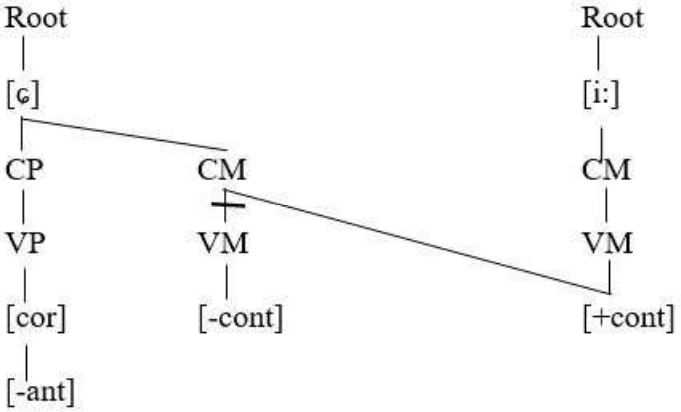
The representation given in Figure (9) shows the ordered processes to derive [tɕ] from [c] which is the intermediary sound

from the underlying dorsal /k/. In (9a), (9b) and (9c), the manner of articulation change occurs by spreading the [+cont] feature of the trigger [i:] to the manner node of the consonant and displaces it to give the consonant a [+cont] designation. Figure (9d) represents the default realization of the affricate. As an affricate, the manner feature is switched to [+Delayed Release] instead of [+continuant].

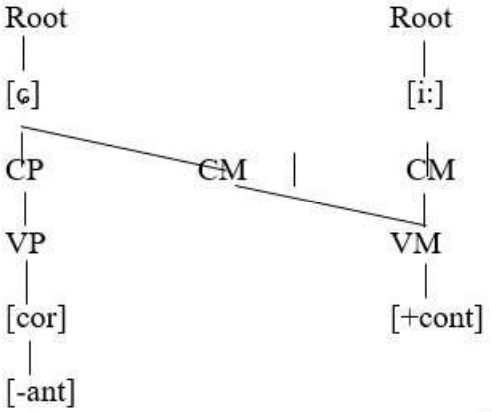
9a



9b [c]: Displacement of CM by VM through De-linking

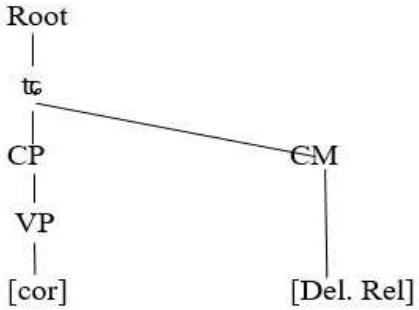


9c [c]: Anchoring of VM at CM



9d.

[ʧ]: Default switch from Palatal Fricative to Coronal Affricate



Summary and Conclusion

In this paper, I have explained the nature of palatalization in Bùlì. I have explained that both full and secondary palatalization occur in Bùlì. I show that the difference between them is based on the triggers and the targets. Targets of secondary palatalization are anterior consonants, namely labials and alveolars, while targets of full palatalization are velars. In both cases, the trigger is the high front vowels /i, i:/.

While palatalization is a general process in the Bùlì language, there is an innovation in the Central dialect which further realizes the alveo-palatal affricate in the environment of /i:/ where the other two dialects of the language, the Northern and Southern dialects retain the palatal stop. This latter process is diachronic in nature as it appears in the speech of younger speakers of the language in the Central dialect in cognates that have the palatal stop in the Northern and Southern dialects. The palatal stop is also realized in cognates of sister languages in the Gur language phylum to which Bùlì belongs.

Using the Feature Geometry framework, the paper has demonstrated that palatalization is a natural phonological process. It showed that the process is assimilatory and involves the spread of vowel features from VP nodes to CP nodes of consonants.

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