

-RXUQDO RI &OLQLFDO ([SHULPHQW
2SKWKDOPRORJ) *DUFLD *DUFLD HW DO - &OLQ ([S
'2,

5HVHDFK \$UWLFOH

2SHQ \$F

\$XWRPDWLF 0HDVXUHPHQW RI &KRURLGDO 7KL
&RKHUHQFH 7RPRJUDSK\ IRU &OLQLFDO)ROOR
'LVHVVH

20JD *DUFLD *DUFLD BRUGDQ &XPSOLGR 2ODLD 6XELUD *RQ]DOH] 3HUH *DUFLD %UX /XLV \$ULDV -RVHS 0
2SKWKDOPRORJ\ 'HSDUWPHQW 8QLYHUVLW\ +RVSLWDO RI %HOOYLWJH +RVSLWDOHW GH /OREUHJDW %D
&RUUHVSRLQLQJ 20D *DUFLD 'HSDUWPHQW RI 2SKWKDOPRORJ\ +RVSLWDO 8QLYHUVLWDUL %HOOYLWJH
7HO (PDL@JJ#JPDLO FRP

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XQUHVWULFWHG XVH GLVWULEXWLRQ DQG UHSURGXFWRQ LQ DQ\ PHGLXP SURYLGHG WKH RULJLQDO D

\$EVWUDFW

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DSSURDFK WR IROORZ XS ,Q WKLV VWXG\ ZH DVVHV WKH FOLQLFDO YDOXH RI
VZHSW VRXUFH WRPRJUDSK\ WR PHDVXUH FKRURLGDO WKLFNQHV

'HVLJQURVSHFWLYH ORQJLWXGLQDO FDVH FRQWURO VWXG\ DW D WHUWLDU\ XQL
3DUWLFLSDOM\SDWLHQWV ZLWK DFXWH 9RJW .RIDQDJL +DUDGD GLVHVVH H\HV
H\HV

0HWKR&KRURLGDO WKLFNQHV VXEIRYHDO DUHD DQG (7'56 JULG ZDV DXWRPDW
RSWLFD FRKHUHQFH WRPRJUDSK\ &KDQJHV LQ WKLFNQHV ZHUH FRPSDUHG WR
JUHHQ DQJLRJUDSK\ ILQGLQJV WR FKHFN IRU FRUOHODWLRQV

ODLQ RXWFRPH PHDQJHV LQ FKRURLGDO WKLFNQHV EDVLFDOHW HW FRGGDU\
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5HVXOWWVEDVHOLQH SDWLHQWV SUHVHQWHG VLJQLILFDQWO\ JUHHWHU PHDQ 6'
> @V > @ DQG (7'56 JULG FKRURLGDO WKLFNQHV@ WKDQ FRQWUROV
'S &KRURLGDO WKLQQLQJ DQG LPSURYHG YLVLRQ ZHUH DVVRFLDWHG ZLWK
ZRUVHQLQJ YLVLRQ ZHUH DVVRFLDWHG ZLWK SRVWHULRU UHODSVH ,Q RI UH
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DQJLRJUDSK\

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LV D UDSLQ GRQ LQYDVLVH PDQQHU RI GHWHFWLQJ SRVWHULRU VJPHQW UHFUXU
SDWLHQWV 6ZHSW VRXUFH WRPRJUDSK\ FRXOG UHGXFH WKH QHG IRU DQJLRJUDS

.HIZRUG&KRURLGDO WKLFNQHV 6ZHSW VRXUFH RSWLFD FRKHUHQFH WRPRJUDSK\ XYHLWL
WRPRJUDSK\ \$FXWH 9RJW .RIDQDJL +DUDGD DQJLRJUDSK\ SROLRVLV

,QWURGXFWLRQ

9RJW .RIDQDJL +DUDGD 9.+ VIQGUHQIRUHQORZXS LQVXUHQFHV DQJLRJUDSK\ W
JUDQXORPDWRXV XYHLWLW WKDW W\SLFD OO\ DVVHVH WKH RSHQ DFFHVV DUWLFOH
IHDWXUH EDVHG RQ WKH GXUDWH DQJLRJUDSK\ DQJLRJUDSK\ DQJLRJUDSK\ YHVV
VWDJH RI 9.+ LV FKDUFHWURJLGHV LEA PXOWLRFDO DUHDV RI FKRURLGDO WKLFNQHV
VXEUVXLODQ RU EXOORXV VHURXV UHWLQDO GHWDPLQJLQJ ZLWK RUS LV WK
ZLWKRXW QHXURORJLF KHGDGFKHV PHDQJHV LQ FKRURLGDO WKLFNQHV GLDJQRVH RFFX
KISRDFVL DQJLRJUDSK\ DQJLRJUDSK\ DQJLRJUDSK\ DQJLRJUDSK\ DQJLRJUDSK\ DQJLRJUDSK\
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DQG WKH YLWURXV ZLWK FKDUFHWULIHWLFD SLJPHQWU\ FKDUFHWULIHWLFD DQJLRJUDSK\ &RQ
DQG VXQVHW JORZURQJLQJ UHFUXUHQW SURFHGXUHQFH ERQWUDVW LQMHI
E\ FOLQLFDO VLJQV RI GLVHVVH DFWLYLW\ LQ WKH DQWULRU VJPHQW RI WKH

&LWDWLEBQFLD *DUFLD 2 -RUGDQ &XPSOLGR 6 6XELUD *RQJDOHJ 2 *DUFLD %UX 3 \$ULDV /
7KLFNQHV V ZLWK 6ZHSW 6RXUFH 2SWLFDO &RKHUHQFH 7RPRJUDSK\ IRU &OLQLFDO)
([S 2SKWKDOPRO L

3DJH RI

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WKH SHUVLVWHQFH RULQHFRBDWQRQ RI WKRUUFLDZLWK D VLPXOWDQHRXV GHFU

H UHODWLYHO\ UHFHQW GHYHORSPHQW ZDV WP ZLWKRXW EKDOJHV LQ 9% DVHG
RSWLFDO FRKHUHQFH WRPRJUDSK\ (' 2&7 EDVHG SRQVSHFWUDO GRPDLO
2&7 KDV HQDEOHG LQ YLYR HYDOKDVKLRQ RY WZH SHURUPHG SURY* \$GLOJ DOO SDV
GH)QLWURQV VHFWRQDO LPDJHV > @ RYU PPHBYV LFXGLH DWHUJH QVH VFK
(' 2&7 WR DVVHV FKRURLGDO WKLFNQHV FKRURLGDO WKLFNQHV WKH LQ
H\HV > @ +RZHYHU EHFDXVH (' 2&7 LV XQDEOH WR GHVHFW WKH WR UHOD
FKRURLG VFOHUDO LQWHUIDFH LQ PDQ\ FDVHV IURP RI H\HV FKRURLGDO
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UHDVRQV DXWRPDWLF VJPHQWDWLRQ ZLWK WKH FKRURLGDO VHU 5, Z&OG FRSFR
SUHIHUDEOH UHFHQW GHYHORSPHQW ZDYHSHQJWRXVDFG RSVDFLOJ VSHHG RI
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VHJPHQWDWLRQ ZLWKRXW WKH GUDZEDFNQR\ DQXDFORPHHQWV 6V78Q SVWRW
D -P EDQG OLJKW VRXUFH WKDW DOORZV DGRKSHISHU SWHFNQDWRVQ ZAVR PKH
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DEOH WR VLPXOWDQHRXVO\ GLVSOD\ D BFKVRIGWKPDJUR\ ERWK WKH WHVDEPWLQ
FKRURLG WKXV SURYLGLOJ EHWWHU YHQWOLH VLRQVH HRYH DQDQKFRWBO
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UHOHDEOH WRRO IRU PHDVXULQJ FKRURLGDFNWKLVNQH\V ZHUH@XVHG DQ 2&7HUHO

'XH WR WLVHDVORQ VWUDLQV PDQXDVFDP SURGXFWWRV D\H PP UHWLQDO DQG
W\SLFDOO\ LPSUDFWLFDQ LQ GDLO\ FOLPDQV DQVWVFRDWHG @VHJPHQWDWLRQV
ZH XVH 66 2&7 DW RXU FHQWUH WR DXWRPDWLFDOOPHGXFKRURLGDO WKLFN
WKLFNQHV 'HVLWH WKH DGYDQWDJHV ZLWKRXW (75)PL#UVJPHQWDWLRQ ZLWKRE 6
2&7 WR RXU NQRZOHGJH WKLW WHFKQLTXH XBNVQRW 6&7HQGHVY&XV ZHUHGWKR
SURVSHFWLYHO\ PRQLWRU WKH FRXUVZLWK 66 2&7DQGLQSDWLVH ZLWDFQW
9.+ DJH PDWFKHG FRQWUROV ERWK PDQXDOO\

,Q WKH SUHVHQW FDVH FRQWURO VWXG\ ZH SURVSHFWLYHO\ DVVHVHVG D VHUL
RI SDWLHQWV GLDJQRVHG ZLWK 9.+ H XPH 66 2&7RORZHVXUH QVXOWDWL
FKRURLGDO WKLFNQHV DW EDVHOLQH LQGDYDQWDJHV DFRPHSRQVWRQHUGW
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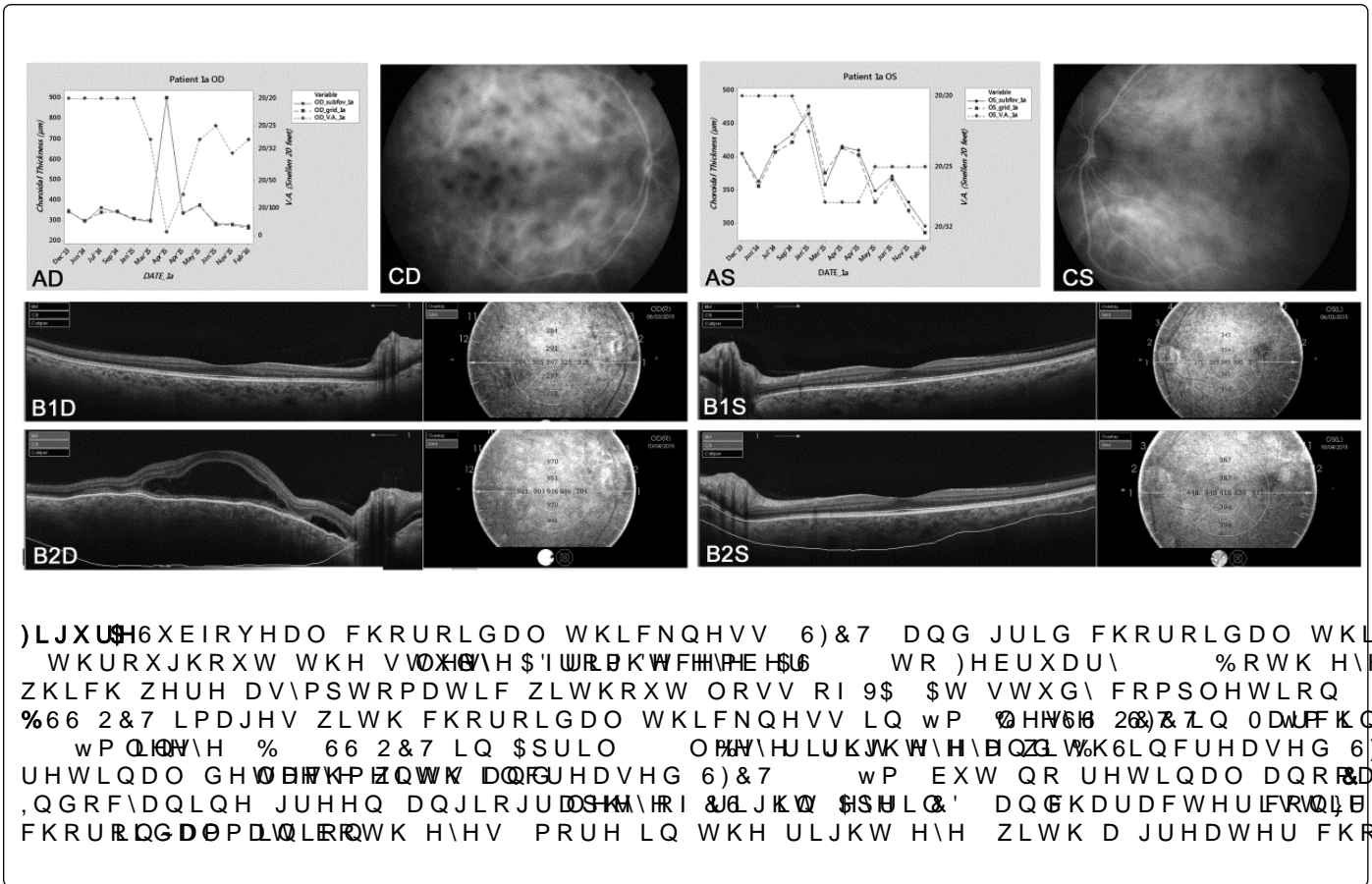
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LQFOXGHG DQ HVWDEOLVKHG GLDJQRVDFRFRIDWHRDUVQVWLWXWLRQ DFFRUGLQ
WR WKH UHYLVHG GLDJQRVWLF FULWHULD IRU 9.+ GLVHDVH >@ (LFOXVLRQ
FULWHULD ERWK FDVHV DQG FRQWUROV &KDOHYLQDQKURLGDOVWLFRVWZ
RU VXUJHU\ PIRSLD RU KISHUPHWURSDUJUDWVHUZLWKQWKHVGFKDQJHV ZHUH
> @ RU DQ\ KLVWRU\ RI V\WHPLFGLVHDVH RWKHU WKDQ 9.+ ZLWK
RFXODU LQYROYHPHQW

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IHHW 0DQQ :KLWQH\ 8 WHVW ZDV XVHG DV DSSU

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QXPEHU 35

&LWDWLEBQFLD *DUFLD 2 -RUGDQ &XPSOLGR 6 6XELUD *RQ]DOH] 2 *DUFLD %UX 3 \$ULDV /
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 ([S 2SKWKDOPRO RL

3DJH RI



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 WKURXJKRXW WKH V\XO\H\$'IWRP'KWFHHPHSLU WR)HEUXDU\ %RWK H\HV KD
 ZKLFK ZHUH DV\PSWRPDWLF ZLWKRXW ORVV RI 9\$ \$W VWXG\ FRPSOHLRQ D QRU
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 wP Q\H % 66 2&7 LQ \$SULO 0P\HULUKJKW\H\BQZ\WK6LQFUHDVHG 6)&7
 UHWLQDO GHV\B\K\ZWK DQFUHDVHG 6)&7 wP EXW QR UHWLQDO DQRDOLHV
 ,QGRF\DQLQH JUHHQ DQJLRJUDSK\RI &LJKW \$SULO' DQGDUDFWHUFRQD\BPKSR
 FKRURLGDOPLRQWK H\HV PRUH LQ WKH ULJKW H\H ZLWK D JUHDWHU FKRURLG

\$JH	6H[	&OLQLFDO SUHVHQWDWLRQ		'D\ V XQWLO GLDJQRVLV 9.+ W\SH	7UHDWPHQW
		2QVHW	6WXG\ HQG		
)	)	3DSLOOLWLV 28 5'V R IXQG XV FKDQJHV		,	3'1 6DULOXPDE
)	)	3DQXYHLWLV 3DSLOOLWLV 28 28	5'V 28 DQG 5'V 0DFXODU 53(K\SHUSODVLD 28	8	3'1 00
0	0	5'V 28 JDOHD K\SHUHVVWKHVLD	FDSLWLV 0DFXODU 53(K\SHUSODVLD 28	,	3'1 00
)	)	3DSLOOHGHPD DQG 33\$ 28	0DFXODU 53(K\SHUSODVLD 28	,	3'1
0	0	3DSLOOHGHPD DQG DOHQ IXFKV 26	0DFXODU 53(K\SHUSODVLD 28	&	3'1
0	0	3DQXYHLWLV 5'V 28 0HQLQJLVP JDOHD K\SHUHVVWKHVLD	0DFXODU 53(K\SHUSODVLD DQG 6XQYHW RZ 28 FDSLWLV 33\$ 2'	,	3'1
0	0	3DSLOOHGHPD DQG R IXQG XV FKDQJHV		&	3'1
0	0	3DSLOOHGHPD DQG 0HQLQJLVP K\SRDFXVLD	5'V 28 R IXQG XV FKDQJHV	,	3'1
0	0	3DQXYHLWLV 5'V 3DSLOOHGHPD 28	R IXQG XV FKDQJHV	&	3'1

))HPDOH 0 0DOH 28 %RWK (\HV 5'V 0XOWLSOH 5HWLQDO 'HWDFKPHQWV 26 /HIW (\H 53(5HWLQDO
 9.+ 9RJW .R\DQDQJL +DUDGD W\SH , ,QFRPSOHHW 8 8YHR 0HQLQJHDO & &RPSOHHW 3'1 3UHGLVRQH

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 ([S 2SKWKDOPRO

3DJH RI

	9\$ 3UH 5HODSVH	9\$ HDW 5HODSVH	'HFUHDVH VHVLQR	6)&7 3UH 5HODSVH	6)&7 —P SDW 5HODSVH	,QFUHDVH 7KLFNQHV	ORQWKV VGLDJQRVLV	VLQFHUV HGG	DW	VWXG
3 5 2'			QR							
3 5 26			QR							
3 5 26			\HV							
3 5 2'			\HV							
3 5 26			QR							
3 5 26			QR							
3 5 2'			QR							
3 5 2'			QR							
3 5 26			QR							
3 5 26			\HV							
3 5 2'			QR							
3 5 26			QR							
3 5 26			QR							
3 5 2'			\HV							
3 5 2'			\HV							
3 5 26			\HV							

3 3DWLHQW 5 5HODSVH 2' 5LJKW (\H 26 /HIW (\H 9\$ 9LVXDO \$FXLW\ GHFLPDO 6)&7 6XEIRYHDO &K

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 VLQFH GLDJQRVLV RI WKH LOOQHVV DQG \HDUV RI IROORZ XS DW WKH HGG RI WK

	'HFLPDO 9LVXDO \$FXLW\ %DVHOLQH 2' 26	6WXG\ HGG 2' 26	%DVHOLQH 6)&7 2' 26 —P 6WXG\ HGG 6)&7 2' 26 —P	1RUPDO —P WKLFNQHV
				<HV 28
				<HV 28
			• 28	<HV 28
				<HV 2' WKLFNHU 26
			• 28	<HV 2' 7KLFNHU 26
			• 28	7KLFNHU 28
				<HV 28
				7KLFNHU 28
				7KLQQU 28

2' 5LJKW (\H 26 /HIW (\H 6)&7 6XEIRYHDO &KRURLGDO 7KLFNQHV —P 0LFURPHWHUV 28 %RWK (\HV

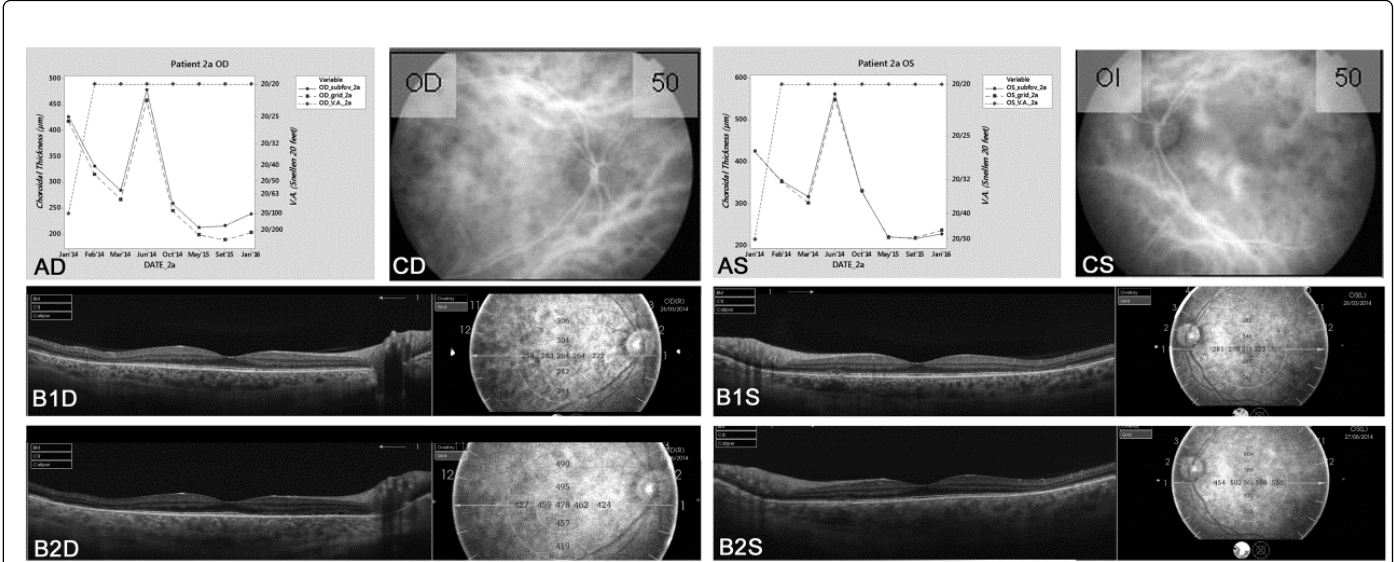
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([S 2SKWKDOPRO L

3DJH RI

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PHDQ LQFUHDVH LQ 6)&7 ZDV wP I U R P H R U G W H W L Q J O \ O R V V R I 9 \$ Z D V
QRW GLUHFWO\ FRUUHODWHG ZLWK WKH D P R X Q W R I L Q F U H D V H L Q 6) & 7 I U R P
H [D P S O H R Q H S D W L H Q W H [S H U L H Q F H G D Q L Q F U H D V H R I D J O R W P L Q 9 \$ & 7 D O G E X W
R Q O \ D G H F U H D V H L Q 9 \$ I U R P W R E R P S O H W L R Q D O R W K H U S D W L H Q W K D G
D Q L Q F U H D V H R I w P W K D W U H V X O W H G L Q D G H F U H D V H L Q 9 \$ I U R P W R

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H\HV QRWDEO\ RI WK9\$ K D H V Z E R K U R O G O D W K L F N Q H V V V K R Z H G D V O L
9\$ RI 7 X O H H \ H V H [S H U L H Q F H G Q R O V D E O U R W K I E O W Q F W S O V Z E L W K R X W
LQ YLVLRQ DW VWXG\ FRPSOHWLRQ ZKLOH YLVLRQ UHPDLQHG XQFKDOILHG
PD[LPXP YLVLRQ LQ H\HV DQG H\HV HTSHULHQFHG D G R O O R Z X S I D Q D O H V H Q G R V
YLVLQRQ IURP 9\$ DW B Q D I R O L O R Z X S D W W D E O H V S D W L H Q W) L J X U H S D W
8VLQJ WKH FKRURLGDO WKLFNQHV V RI WKH FRQWURO JURXS wP DV
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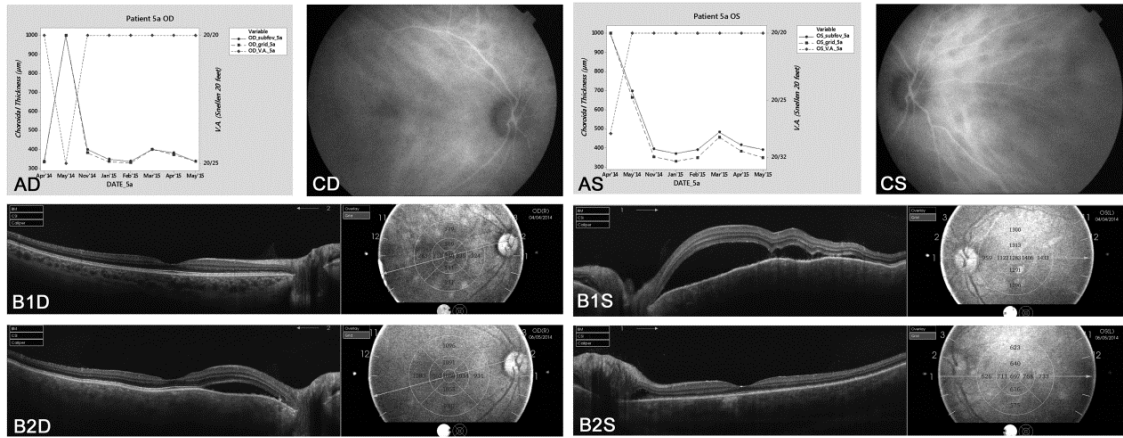


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GLDJQRVHG E\ 66 2&7 LQ 0DUFLQ - D P P O R W K H U W L Z E V H R E V H R R Q U Z K W K W K H S U H \$
VWXG\ FRPSOHWLRQ FKRURLGDO WKLFNQHV V D O G E X W 6 Z E H 7 L P P U I P I O Z L W K W P K B U R K L V
wP 5LJKW H\H H V H D Q G L Q H E U X D U \ & K R U R L G D O W K L F N Q H V V Z D V Q R U P D O
% 66 2&7 0DUFJ ZLWK LQFUHDVHG 6)&7 W R N L Q U L J K W Q R H U H \ W L Q D F Q D O H L Q L
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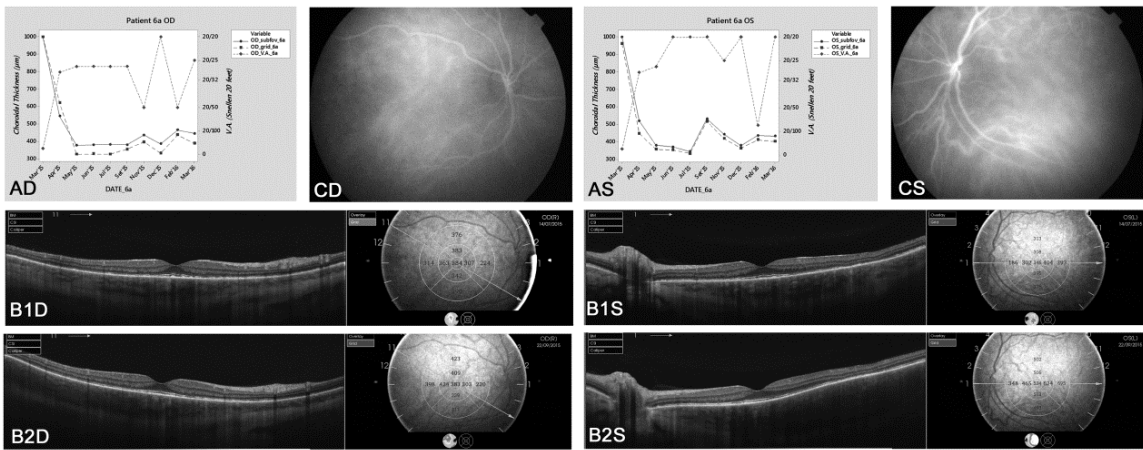
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RI 66 2&7 IRU WKH SDVW VHYHUDO \HDUV WR RPHVXUHQFKRURLGDODSVKHFZOVGLS
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PHWKRGR RI GHWHFWLQJ SRVWHULRU VHDWPHQWV HOGFDWYDQW W K D W 66 2 &
UHVSRO\ HDLQ DLP RI RXU VWXG\ ZDV W B O X H O H P O M X Y K W F Q L Q F S Q W R U D S L G O
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([S 2SKWKDOPRO RL

3DJH RI



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VHURXV UHWLQDO GHWDFKPHQW V\FURUMLJKRV GHWDFKPHQW EWSZHFDO WOKH PNUHHVQV DQJLRJU
&' DQSWH &6 RI 6RQYUWKH H[LQVHDFPHZVWRKQ\SRSLJPHQWHG VSRWV LQ ERWK



)LJXUS6XEIRYHDO FKRURLGDO WKLNFQHV 6)&7 DQG JULG FKRURLGDO WKLNFQH
WKURXJKRXW WKH VWOXNH\$' IURJKW\$SHLD \$6 WR ODUFK %DVHOLQH 6)&7 !
ZHUH GHWHFWHG LQ WKH ULJKW H\H ZLWK LQFUHQVHG FKRURLGDO WKLNFQHV
GHWHFWHG EHIRUH GLDJQRVLV RI VPSWRPDWLF EOXUHG YLVLRQ ZLWK VSDQGDQGL
FKRURLGDO WKLNFQHV LQHWRH 5%JKWLQ\$SU%LO DQG VWDQGDUG 6)&7 DQPRVW QRUPDO
ULJKW H\H OHPHDQJHVSHF LQ 6HSWHPEU 6)&7 RI ULJKW H\H UHPDLQH OHPHDQ
wP ,QGRF\DQLQH JUHHQ DQJLRJUODSKH R &6 LKRVHSHFPHQW EWSZHFDO
ZLWK FKRURLGDO YDFXOLWLV

H }QGLQV RXU VWXG\ DUH FRQVLVWHQW YLWXVSHUHDVXVHGHSRWWRPDWLFDOO\
GHVFULVLUJQL]DQVH LQ FKRURLGDO WKLNFQHV V\FRQSDUWLHGQMKH ZHWZLWK WKH
DFXWH 9.+ > @ 7R YHUL\ WRHWDHSHQHGZLWKW666ZQFVLRQI WKHDOWK\

